ORDER NO. MTC9412587F1
D6

Service Manual

Color Monitor/Receiver

Model

CT–2784VY

Chassis

ALMEDP224

Main Manual

(NA3)

Specifications

Power Source:	120 volts, 60 Hz, AC
Power Consumption:	1.8 amps Max.
Antenna Terminal Impedance:	(1) UHF/VHF 75Ω input
Channel Capability:	181 Channels (Phase 18 Synthesizer)
Off the Air:	VHF 2~13, UHF 14~69
Cable:	125 Channels
(2) Video Input Jack:	1V p–p 75Ω phono jack type (Included: 1 RCA–BNC Adaptor)
(2) Audio Input Jack (L & R):	500mV RMS, High impedance–10k (phono jack type)
(1) S–Video Input:	Round 4 pin S–Video connector (rear)
Audio Out/Variable:	0~1V. RMS, 10k (30% Modulation)
Stereo Output Power:	3.5W x 3.5W (10% Distortion)
Comb Filter:	Separates video signal from chroma
Remote Control:	Easicon Infra–red system EUR501200
Picture Tube:	27" diagonal (Viewing area) 110 degree deflection A68JUA069X
Anode Voltage:	30.5kV Max. (Zero beam) 29.25kV ±1.25kV
Dimensions:	Height – 23–5/8" (600mm) Width – 26" (660mm) Depth – 19" (483mm)
Weight:	81.5 lbs. (36.97kg)

Specifications are subject to change without notice or obligation. Dimensions and weight are approximate measurements.

The service technician is required to read and follow the "Safety Precautions" and "Important Safety Notice" in this manual.

"WARNING! This Service Manual is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non–technical individuals of potential dangers in attempting to service a product. **Products powered by electricity should be serviced or repaired only by experienced professional technicians.** Any attempt to service or repair the product or products dealt with in this Service Manual by anyone else could result in serious injury or death."

Panasonic ®

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A–Board Schematic (CT–2784VY)

Waveforms – A–Schematic

Waveforms #19 & #20 are Hot Ground, the others are Cold Ground.

1. 0.9V p–p [20µs]
2. 0.7V p–p [20µs]
3. 0.4V p–p [20µs]
4. 0.2V p–p [20µs]
5. 0.5V p–p [1µs]
6. 4.3V p–p [20µs]
7. 3.2V p–p [20µs]
8. 3.6V p–p [20µs]
9. 1.2V p–p [20µs]
10. 4.6V p–p [5ms]
11. 3V p–p [5ms]
12. 49V p–p [5ms]
13. 1.6V p–p [20µs]
14. 0.8V p–p [5µs]
15. 2.5V p–p [20µs]
16. 184V p–p [20µs]
17. 231V p–p [20µs]
18. 26V p–p [20µs]
19. 14V p–p [5µs]
20. 332V p–p [5µs] 0V DC

Waveform Measurements

1. ③ indicates waveform measurement. (Measurement can be taken at best accessible location in common to indicated point.)
2. Taken with a NTSC signal generator connected to antenna terminal. (NTSC color bar pattern of 8 bars of EIA colors, 100 IRE white and 7.5 IRE black)
3. Customer Controls (Picture/Audio Menu) are set to Normalize. Volume "MIN".
4. All video and color waveforms taken with a wideband scope and a probe with low capacity (10 to 1). Shape and peak amplitudes may vary depending on type of Oscilloscope used and calibration.
5. Ground symbol ⏚ shown on waveform number indicates (Hot) ground lead connection of Oscilloscope.
   CAUTION: Incorrect ground connection of test equipment will result in erroneous readings.

These waveforms have been taken in the order of circuit flow through the various sections as follows:

VIDEO – Waveforms 1–3
COLOR – Waveforms 4–8
VERTICAL – Waveforms 9–12
HORIZONTAL – Waveforms 13–16
CRT DRIVE – Waveforms 17 & 18
POWER SUPPLY – Waveform 19 & 20

Schematic Notes

1. Resistors are carbon 1/4W unless noted otherwise.
2. Capacitors are ceramic 50V unless noted otherwise.
3. Coil value noted is inductance in µH.
4. Test point indicated by ▼, Test point but no pin ⚲
5. Components indicated with ⚠ symbol are critical parts and replacement should be made with manufacture specified replacement parts only.
6. **— (BOLD LINES)** Indicates the route of B+ supply.
7. This schematic diagram is the latest at the time of printing and subject to change without notice.
8. Ground symbol ⏚ indicates **HOT GROUND**
   CONNECTION and ⏚ indicates COLD GROUND CONNECTION.

NOTE: All other component symbols are used for design engineering purposes.

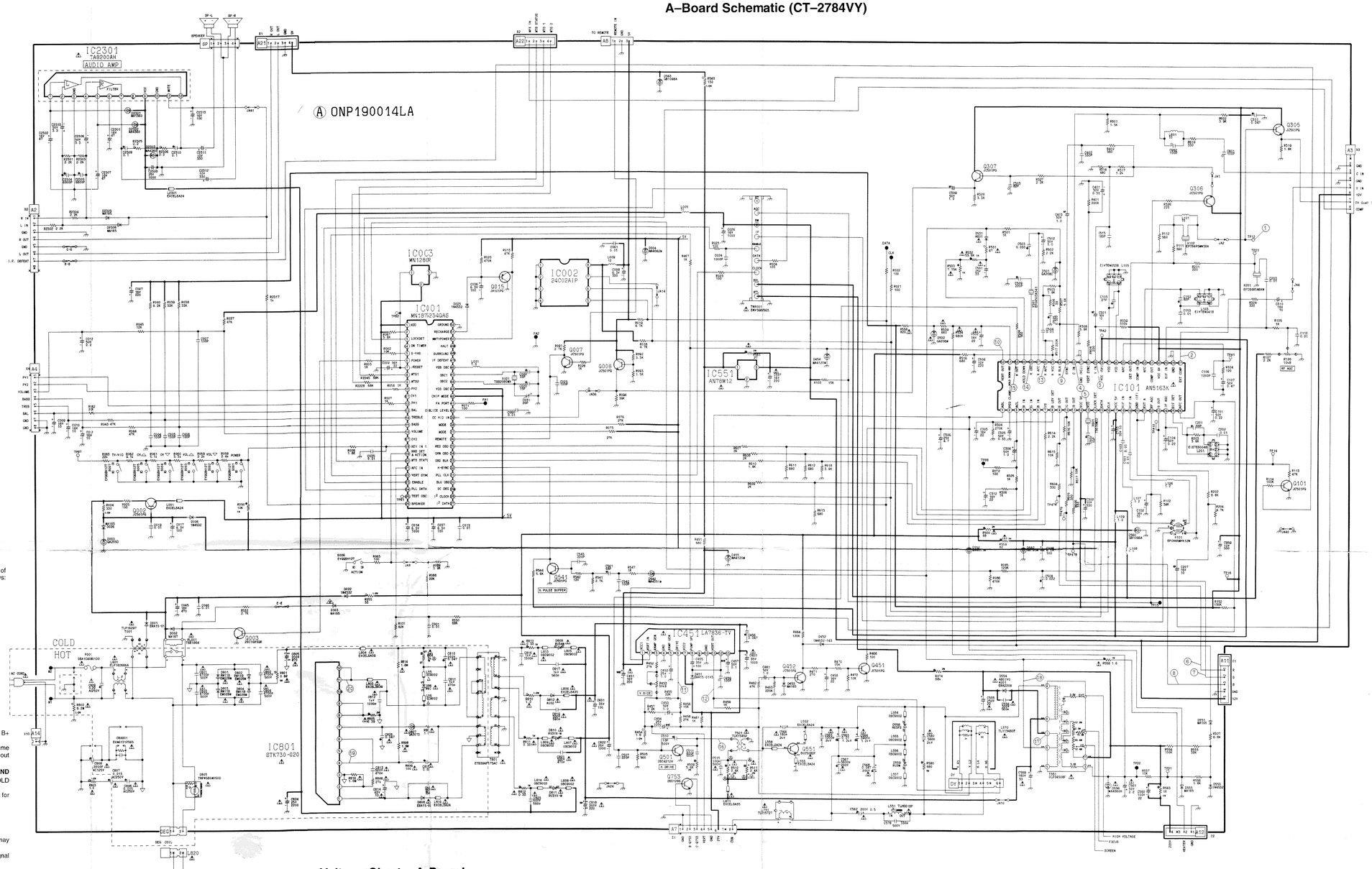
Voltage Measurements

1. Voltage measurement:
   – AC input to Receiver is 120V. NTSC generator connected to antenna of Receiver. (color bar pattern of 100IRE white and 7.5 IRE black.)
   – All Picture and Audio adjustments set for Normalize.
   TV ANT/CABLE – (Set–Up Menu) in TV/ANT Mode
   Volume – Min
   TV/Video SW – TV position
   Audio Mode – Stereo
   – Voltage readings are nominal and may vary ±10% on active devices.
   Some voltage reading will vary with signal strength and picture content.
   – Supply voltages are all nominal.
2. Ground symbol ⏚ indicates ground lead connection of meter. **Caution: Incorrect ground connection will result in erroneous readings.**

Circuit Board Function Index

CIRCUIT BOARDS	FUNCTION
A–BOARD	MAIN
C–BOARD	CRT
E–BOARD	STEREO/SAP DECODER
R ASSEMBLY	REMOTE RECEIVER
Z–BOARD	PINCUSHION CORRECTION
X–BOARD	A/V INPUT SWITCH, A/V–S–VIDEO SWITCH, AUDIO AMP, COMB FILTER & B/T/B CONTROL

A–Board Schematic (CT–2784VY)



Voltage Chart – A–Board

Integrated Circuits (ICs)

IC001				IC002				IC101				IC451		IC801 ⏚	
1	5.2	27	4.9	1	0			1	2.5	27	2.7	1	12.5	1	–35.4
2	5.2	28	4.9	2	0			2	1.7	28	0	2	4.1	2	–29.3
3	4.6	29	0	3	0			3	3.3	29	2.7	3	6.2	3	0.2
4	5.2	30	0	4	0			4	0	30	9.1	4	0	4	–0.3
5	0	31	4.7	5	5.0			5	0	31	5.2	5	6.5	5	1.5
6	4.7	32	4.7	6	5.0			6	0	32	2.9	6	5.6	6	1.4
7	5.3	33	0	7	0			7	0	33	2.7	7	26.0	7	–0.2
8	5.1	34	0	8	5.3			8	5.8	34	2.8	8	2.4	8	0.3
9	0.1	35	0					9	2.8	35	1.8	9	1.1	9	0.3
10	0.1	36	0					10	2.7	36	3.0	10	0	10	NC
11	0.1	37	5.1	IC003				11	2.8	37	3.0	11	15.9	11	VARIES 150–163
12	0	38	5.2	1	5.1			12	9.1	38	5.0	12	27.0	12	VARIES 150–163
13	3.5	39	1.6	2	5.1			13	2.6	39	3.9	13	5.1		
14	3.0	40	1.5	3	0			14	5.8	40	2.6			IC2301	
15	3.0	41	5.2					15	4.9	41	0	IC551		1	1.5
16	0.5	42	5.2					16	4.9	42	2.5	1	16.9	2	0
17	0	43	5.2					17	5.0	43	2.0	2	0	3	0
18	5.2	44	2.6					18	2.9	44	0.3	3	12.0	4	0
19	2.5	45	2.6					19	2.9	45	6.2			5	1.6
20	4.6	46	0					20	0	46	2.6			6	6.0
21	2.0	47	0					21	0	47	4.2			7	8.3
22	4.1	48	0					22	3.2	48	2.1			8	0.8
23	0.1	49	1.4					23	4.5	49	2.4			9	18.0
24	4.8	50	5.1					24	2.7	50	0.8			10	0
25	2.6	51	0					25	4.6	51	5.8			11	0
26	0	52	0					26	4.0	52	4.1			12	8.2

The Functions listed below are activated by a DC voltage change to DAC Inputs (Pin 18 and 19) of MPU IC001. Press and hold a function button on Receiver to take voltage readings.

FUNCTION	PIN 18	PIN 19
POWER	0V–0.6V	0V(Set "OFF") 0.7V–3.0V (Set "ON")
VOL ▼	0.7V–1.2V	0.7V–3.0V
VOL ▲	1.3V–1.8V	0.7V–3.0V
CH ▼	1.9V–2.4V	0.7V–3.0V
CH ▲	2.6V–3.0V	0.7V–3.0V
TV/VIDEO	3.2V–3.7V	0.7V–3.0V
ACTION	4.6V–5.0V	0V–0.6V

The AUDIO MODES being broadcast are displayed on screen in red by the voltage change to DAC input (Pin 20) of MPU IC001.

AUDIO MODE BROADCAST	PIN 20
MONO	4.0V–5.0V
SAP	2.3V–4.0V
STEREO	1.0V–2.0V
STEREO & SAP	0V–0.9V

Transistors

Ref.	b	c	e
Q002	5.9	10.4	5.3
Q003	.7	0	0
Q007	0.6	0.1	0
Q008	1.6	5.2	1.6
Q015	5.2	0	5.2
Q101	0	2.8	0
Q305	1.6	9.1	1.1
Q306	5.2	9.1	4.5
Q307	4.5	9.1	3.9
Q451	0	2.2	0
Q452	0.1	0	0
Q501	0.3	90.3	0
Q541	0	4.7	0
Q551	0	123	0
Q753	0.5	13.8	0

IMPORTANT SAFETY NOTICE

THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES THAT ARE IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS DESIGNATED WITH A ⚠ IN THE SCHEMATIC.

Tuner Voltage Chart

Enabe, Data, and Clock have no DC readings. They are digital signals from the MPU.

NOTE: Voltage at the 30V test pin varies with channel selection. Refer to chart for sample tuning voltages of TV/CATV(CABLE) channels as shown.

Voltage Reading Are Nominal And May Vary ± 15%

– VHF –	
Ch. 02	4.0V
Ch. 06	8.2V
Ch. 07	7.0V
Ch. 13	9.3V

– UHF –	
Ch. 14	7.7V
Ch. 69	24V

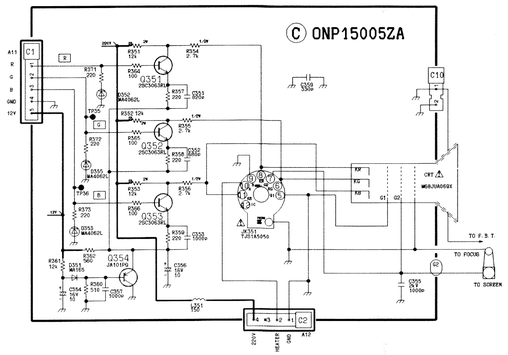
– CABLE –					
1st Band		2nd Band		3rd Band	
Ch. 1	6.7V	Ch. 16	4.5V	Ch. 47	3.7V
Ch. 15	24.7V	Ch. 46	2.70V	Ch. 94	14.9V
Ch. 95	9.8V			Ch. 100	15.1V
Ch. 99	17.5V			Ch. 125	24.0V

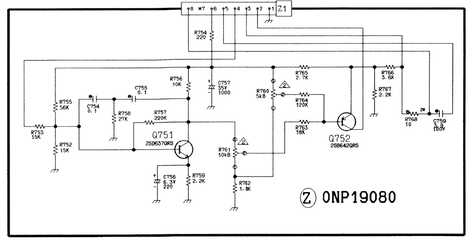
MICROPROCESSOR PROGRAMMING FOR BAND TUNING/SWITCHING

	54MHz → 130MHz		130MHz → 360MHz		360MHz → 806MHz
	FIRST TUNING BAND		SECOND TUNING BAND		THIRD TUNING BAND
VHF	02–06		07–13		
UHF					14–69
CABLE	01–06, 14, 15, 95–99		07–13, 16–46		47–94, 100–125

NOTE: CABLE channel numbers as recommended by the joint EIA/NCTA Engineering Committee and published as EIA INTERIM STANDARD NO. 6 – CABLE TELEVISION CHANNEL IDENTIFICATION PLAN – MAY 1983.

C, E, X & Z–Board Schematics (CT–2784VY)



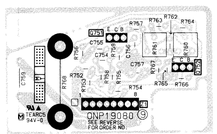


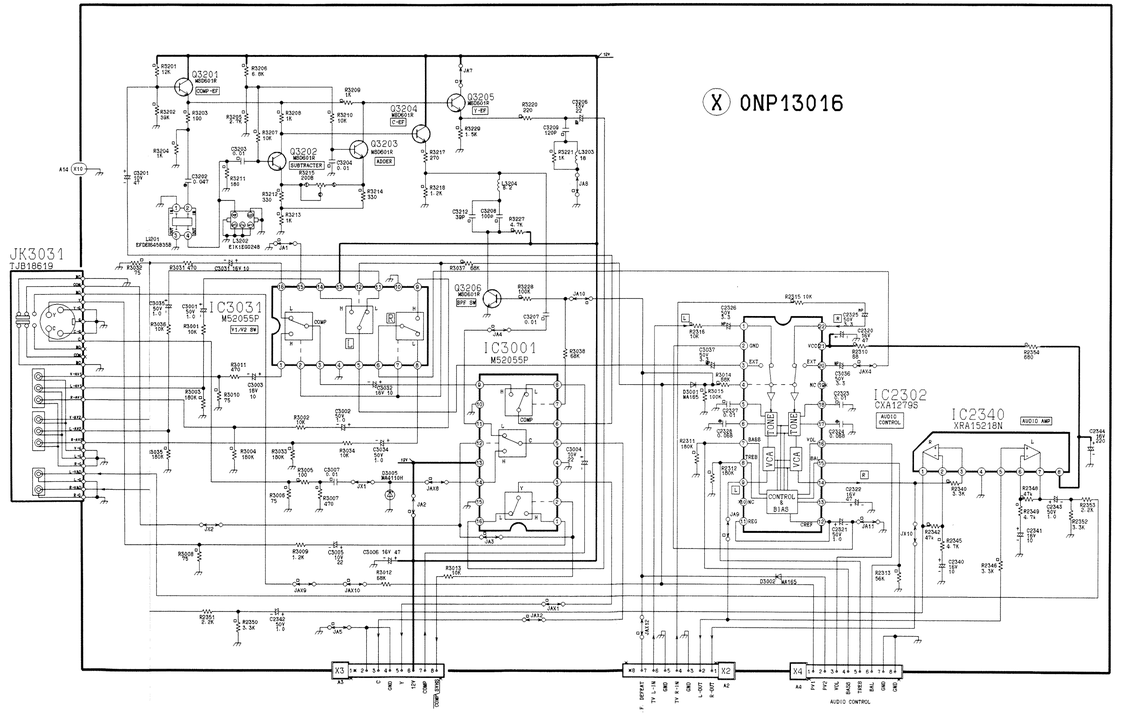
Voltage Chart – Z–Board

Transistors

Ref.	b	c	e
Q751	2.6	9.0	2.0
Q752	9.4	0.5	10.1

Z–Board ONP19080



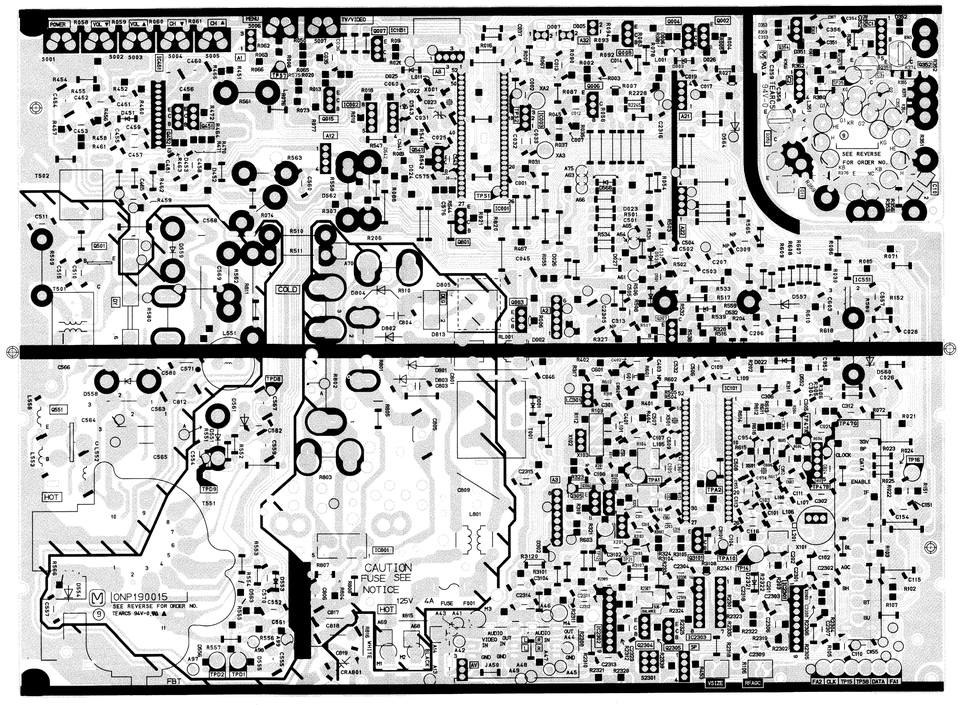


Voltage Chart – CRT–Board

Transistors

Ref.	b	c	e
Q351	2.8	131.8	2.3
Q352	2.7	136.7	2.2
Q353	2.8	134.5	2.2
Q354	0.5	0	1.2

A–Board ONP190014



C–Board ONP15005

Voltage Chart – X–Board

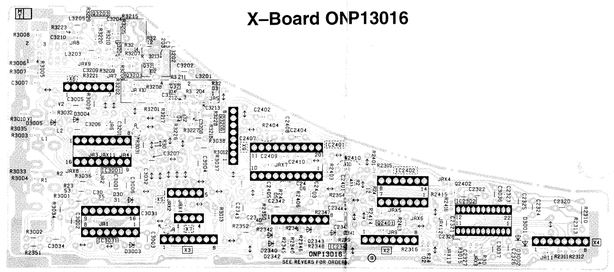
Integrated Circuits (ICs)

IC2302				IC2340				IC3001				IC3031			
1	5.0	12	2.6	1	5.1			1	5.9	9	5.9	1	59	9	5.9
2	0	13	5.1	2	5.1			2	0	10	0	2	0	10	0
3	5.0	14	5.1	3	5.1			3	4.5	11	5.9	3	45	11	5.9
4	0.1	15	2.6	4	0			4	0	12	0	4	0	12	0
5	5.2	16	0.5	5	5.1			5	4.1	13	12.0	5	45	13	12.0
6	5.6	17	5.5	6	5.1			6	4.5	14	5.9	6	45	14	5.9
7	2.5	18	5.2	7	5.1			7	0.2	15	0	7	01	15	0
8	2.5	19	0	8	10.0			8	5.9	16	5.9	8	59	16	5.9
9	5.1	20	5.1												
10	0	21	10.1												
11	2.6	22	5.1												

Transistors

Ref.	b	c	e
Q3201	9.0	12.0	8.1
Q3202	3.3	7.1	2.7
Q3203	3.3	7.1	2.7
Q3204	7.1	12.0	6.5
Q3205	7.1	12.0	6.5
Q3206	0	12.0	0

X–Board ONP13016



Voltage Chart – E–Board

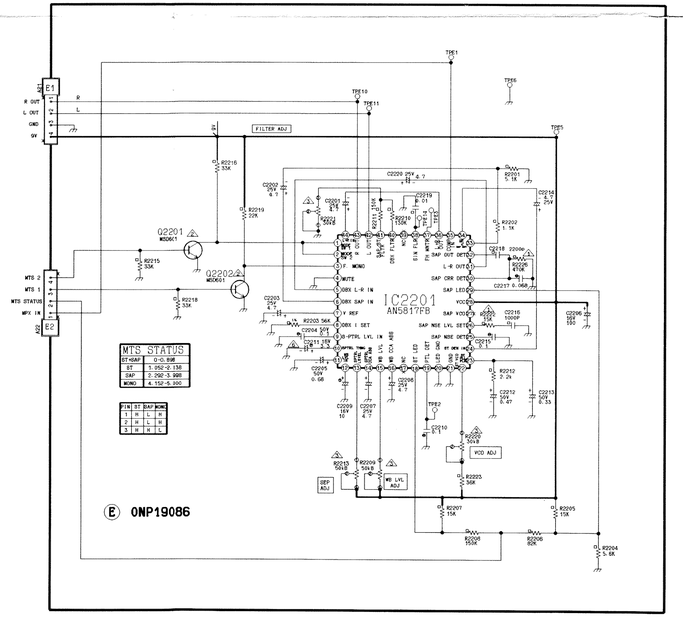
Audio Icon Mode = Mono

Integrated Circuits (ICs)

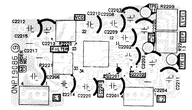
IC2201							
1	2.5	12	0.4	23	2.3	34	1.8
2	2.5	13	2.6	24	2.2	35	2.2
3	0	14	1.8	25	3.1	36	1.4
4	0	15	1.4	26	3.2	37	2.2
5	2.1	16	2.7	27	0.1	38	2.2
6	2.2	17	0	28	4.1	39	0
7	2.3	18	4.2	29	1.1	40	1.2
8	1.4	19	2.3	30	2.3	41	0
9	2.2	20	0	31	2.0	42	2.2
10	1.1	21	0	32	0.3	43	2.3
11	2.5	22	3.4	33	2.9	44	2.2

Transistors

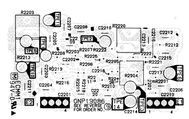
Ref.	b	c	e
Q2201	0	2.5	0
Q2202	0.6	0	0



E–Board ONP19086 (Top Side)



E–Board ONP19086 (Bottom Side)



Important Safety Notice

There are special components used in this television set which are important for safety. These parts are identified on the schematic diagram by the symbol ⚠ and printed in **BOLD TYPE** in the replacement parts list. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent X–RADIATION, shock, fire or other hazards. Do not modify the original design without the permission of manufacturer.

Safety Precautions

General Guidelines

An ISOLATION TRANSFORMER should always be used during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

When servicing observe the original lead dress, especially in the high voltage circuit. In case of a short circuit, replace every part which has overheated.

Always REPLACE PROTECTIVE DEVICES, such as fishpaper, isolation resistors and capacitors and shields after working on the receiver. Use only manufacturers recommended rating for fuses, circuit breakers, etc.

High potentials are present when this set is operating. Operation of the set without the rear cover involves the danger of electric shock from the set's power supply. Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high–voltage equipment.

Extreme care should be used in HANDLING THE PICTURE TUBE. Rough handling may cause it to implode due to atmospheric pressure (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure in removal or installation. When handling, use safety goggles and heavy gloves for protection. Discharge picture tube by shorting the anode connection to chassis ground (not cabinet or other mounting parts). When discharging, go from ground to anode with a well insulated piece of wire.

Avoid prolonged exposure at close range to unshielded areas of the picture tube. Possible danger of personal injury from unnecessary exposure to X–ray radiation may result.

The TEST PICTURE TUBE used for servicing the chassis at the bench should incorporate a safety glass and magnetic shield. The safety glass affords shielding from the tube viewing area against X–ray radiation as well as implosion protection. The magnetic shield limits X–ray radiation around the bell of the picture tube in addition to restricting magnetic effects. When using a picture tube test jig for service, ensure that jig is capable of handling 31kV without causing X–radiation.

BEFORE RETURNING A SERVICED RECEIVER **(of any type)** TO THE OWNER, the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock. DO NOT USE A LINE ISOLATION TRANSFORMER WHEN MAKING THIS TEST.

Leakage Current Cold Check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and each exposed metallic part such as screwheads, antenna terminals, control shafts, etc. If the exposed metallic part has a return path to the chassis, the reading should be between 240kΩ and 5.2MΩ. When the exposed metal does not have a return path to the chassis, the reading must be infinite.

Leakage Current Hot Check (See Figure)

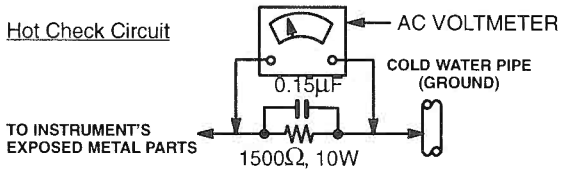
Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5kΩ 10 watt resistor in parallel with a 0.15μF capacitor between each exposed metallic part and ground. Use an earth ground, for example a water pipe.

Using an AC voltmeter with 1000 ohms/volt or more sensitivity, measure the potential across the resistor.

Move the resistor connection to each exposed metallic part and measure the voltage present.

Check that any potential does not exceed 0.75 volt RMS. A leakage current tester (Simpson Model 229, Sencore Model PR57 or equivalent) may be used in the above hot check, in which case any current measure must not exceed 1/2 milliamp. In case any measurement is out of the limits specified, there is a possibility of a shock hazard and the set must be repaired and rechecked before it is returned to the customer.



X–Radiation

WARNING: The potential source of X–radiation in TV sets is the High Voltage section and the picture tube.

NOTE: It is important to use an accurate, periodically calibrated high voltage meter.

Adjust BRIGHTNESS, PICTURE, SHARPNESS and COLOR controls to minimum.

Measure the High Voltage. The high voltage meter should indicate 29.25kV ±1.25kV. If the upper meter indication is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

Horizontal Osc. Disable Circuit Test

This test must be made as a final check before the set is returned to the customer. See HORIZONTAL OSC. DISABLE CIRCUIT PROCEDURE CHECK in this manual.

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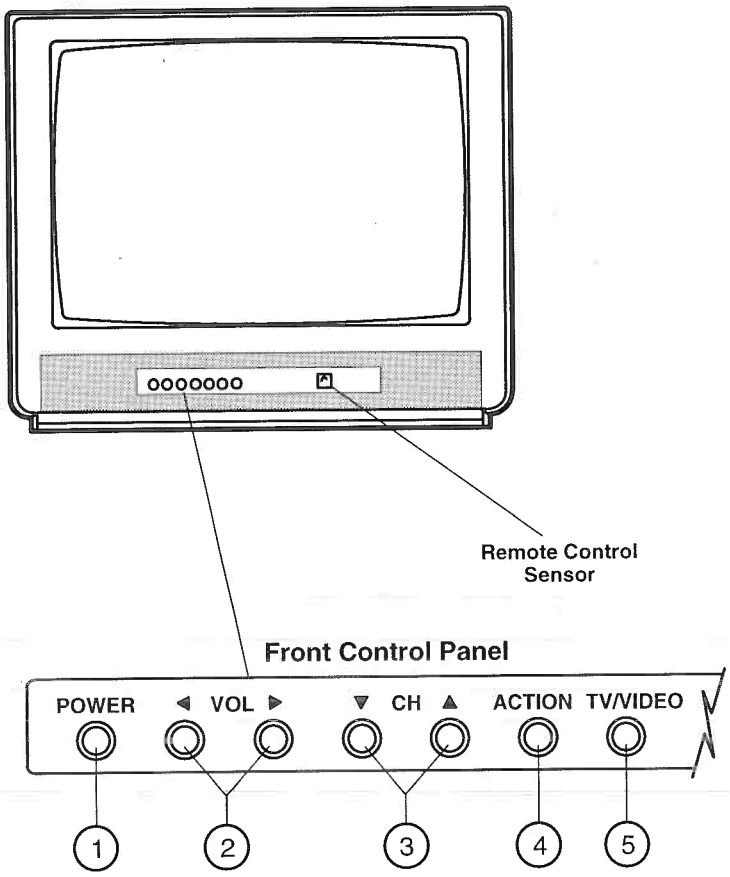
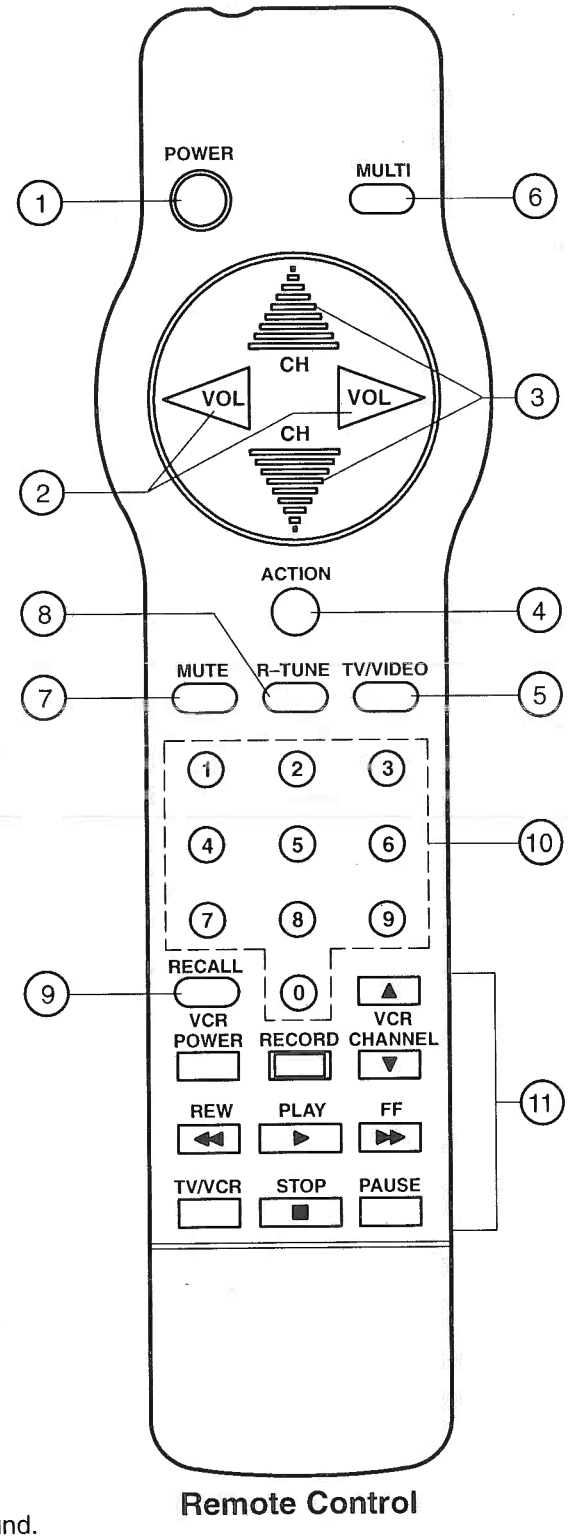
Audio Block Diagram **32**
Video Block Diagram **32**

Followed by 1 Large Separate Pullout Schematic Sheet with All Schematics, Waveforms, Notes, Voltage Charts and Printed Wiring Boards.

Location of Controls





Remote Control

Quick Reference Control Operation

(1) **Power Button** – Press to turn ON or OFF.

(2) **Volume Buttons** – Press to adjust Sound Level. Press to adjust Audio Menus, Video Menus and select operating features when menus are displayed.

(3) **Channel Buttons** – Press to select programmed channels. Press to select desired features when menus are displayed.

(4) **Action Button** – Press to display Main Menu and access On Screen feature and Adjustment Menus.

(5) **TV/Video Button** – Press to select TV or one of two Video Inputs.

(6) **Multi Button** – Programmable to operate up to six Remote Function buttons.

(7) **Mute Button** – Press to mute sound. A second press returns sound.

(8) **R–Tune (Rapid Tune) Button** – Press to switch between two channels.

(9) **Recall Button** – Press to display Time, status of Sleep Timer, Channel, Video Mode, Channel Caption and Audio Mode.

(10) **Keyboard "0 through 9" Buttons** – Press desired channel number to access any channel.

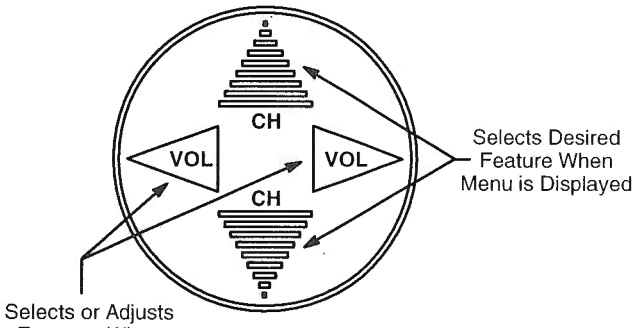
(11) **VCR Function Buttons** – Programmable to operate many brands of VCR's.

Control Operation

ACTION

Displays and Exits Menus

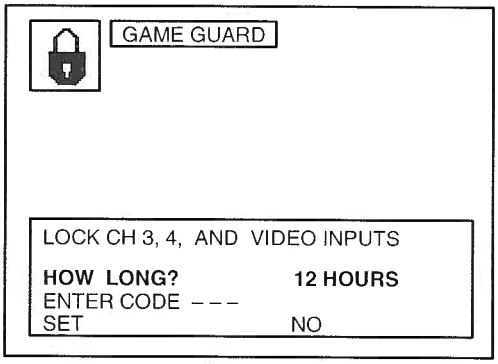
Located On Remote Control



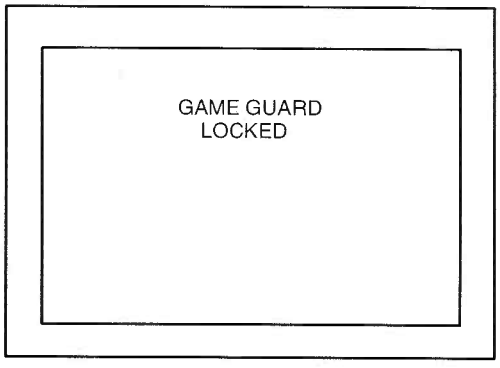
Game Guard (Lockout) – Prevents video games and other video sources from being viewed. Channel 3, 4 and all video inputs are locked out for 12, 24 or 48 hours.

NOTE: Be sure to understand this feature before attempting its use. **Use a code that you will easily remember.**

1. Press the ACTION button to display the Main Menu.
2. Press the CH DOWN button to select the Game Guard Icon.
3. Press the ACTION button to display the Game Guard Menu.



4. Press the VOL RIGHT button to select the desired hours (12, 24 or 48) for Game Guard (Lockout) to be activated.
5. Press the CH DOWN button to select "ENTER CODE". Then enter a 3 digit code with the Remote Control Keyboard.
   Important NOTE: Use a code you can easily remember.
6. Press the VOL LEFT or RIGHT button after entering three digit code. "Game Guard Locked" will display On Screen.



Game Guard Activated

Game Guard (Unlock)

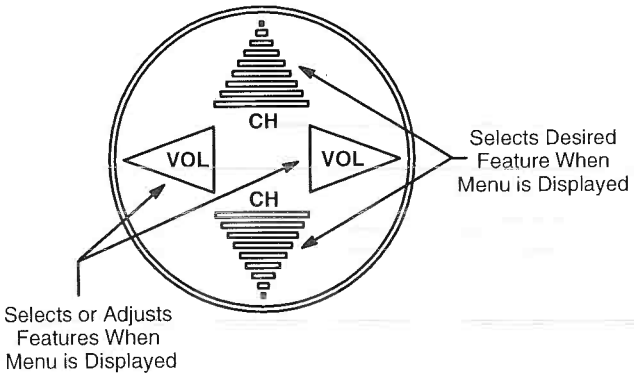
To unlock the Game Guard feature, repeat steps 1 through 3. Enter the same 3 digit code previously used in step 5 with Remote Control Keyboard.

CC Mode

ACTION

Displays and Exits Menus

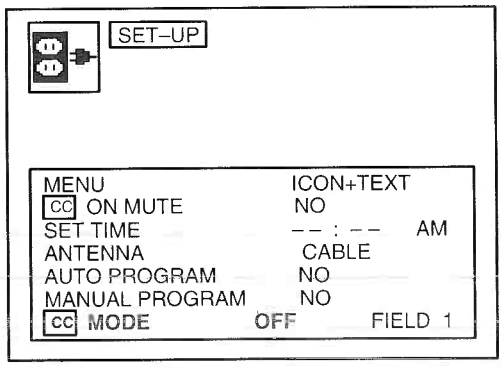
Located On Remote Control



Closed Caption Mode

This Receiver has a built in decoder that provides a visual depiction of the audio portion of a television program in the form of written words across the screen (White or Colored letters on a black background). It allows the viewer to read the dialogue of a television program or other information.

1. Press the ACTION button to display the Main Menu.
2. Press the CH DOWN and VOL RIGHT buttons to select the Set–Up Icon.
3. Press the ACTION button to display the Set–Up Menu.



4. Press the CH DOWN button to select "CC MODE".
5. Press the VOL RIGHT button to select OFF, CAP C1, TEXT C1, CAP C2 or TEXT C2.
6. Press the CH DOWN button to select the Field position.
7. Press the VOL LEFT or RIGHT button to select "FIELD 1" or" FIELD 2".
8. Press the ACTION button twice to exit the Set–Up Menu.

- CAPTION OFF – Recommended mode when you do not wish to view Closed Caption.
- CAPTION C1 – For video related information that can be displayed (up to 4 lines of script strategically placed on the television screen so that it does not obstruct relevant parts of the picture). Script can be in any language.
- TEXT C1 – Blanks out a large portion of the picture on the television screen, and displays program guide or any other information currently being transmitted.
- CAPTION C2 – Another mode used for video related information that can be displayed (up to 4 lines of script strategically placed on the television screen so that it does not obstruct relevant parts of the picture).
- TEXT C2 – Another mode which displays information and blanks out a large portion of the picture on the television screen.

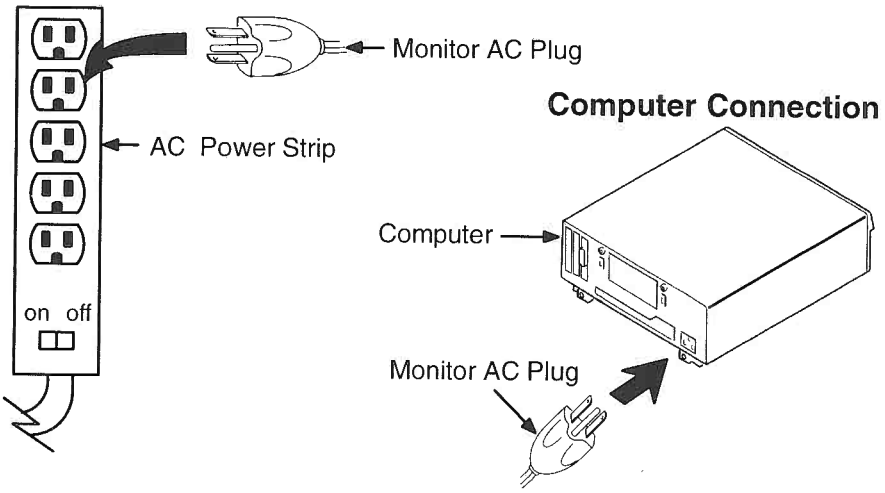
Helpful Hints:

- Closed Caption information may be transmitted on either or both Caption Fields.
- Most Closed Caption information is transmitted on Field 1 in Cap C1 Mode.
- De–select Text mode if large portion of the picture is blanked out.

Instant–On Feature

This Monitor/Receiver has an Instant–On feature which automatically turns the unit ON when AC power is supplied. This feature initiates the Monitor/Receiver to turn ON automatically when using it with other equipment connected to a main power supply switch. (Such as: AC power strip or when plugged directly into the back of a computer.)
Once initial power has been supplied and the Monitor/Receiver turns ON, the POWER switch located on the front of the Monitor/Receiver may be used to turn the Monitor/Receiver OFF and ON as desired.

AC Power Strip Connection



Procedure for Instant–On feature

With the Monitor/Receiver turned ON, press the ACTION and VOLUME DOWN buttons (on the Monitor/Receiver) simultaneously, then press the ACTION and CHANNEL DOWN buttons (on the Monitor/Receiver) simultaneously. This will activate the Instant–On feature. To deactivate, repeat procedure.

NOTE: There will be no On Screen display.

To confirm if the Instant–On feature is activated. Turn the Monitor/Receiver OFF, then unplug it and plug it back in. The Monitor/Receiver should turn ON automatically.

Keyboard Lock Feature

Procedure for Keyboard Lock feature

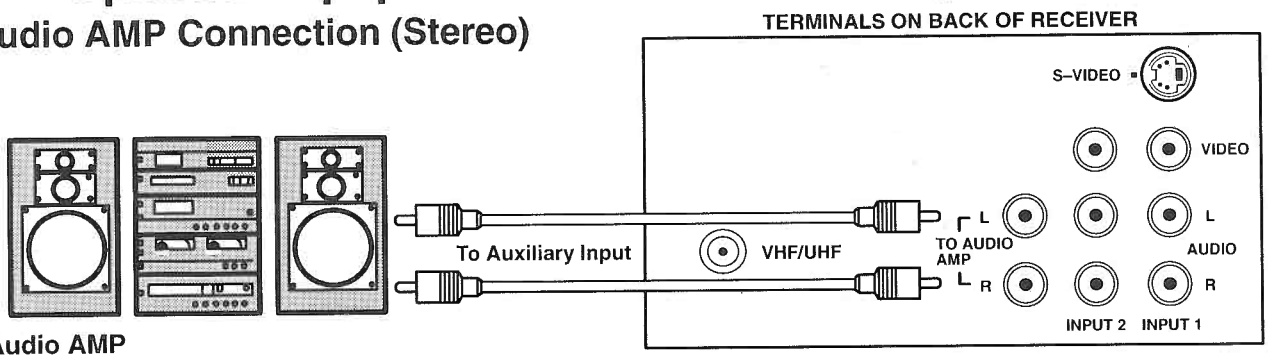
With the Monitor/Receiver turned ON, press the ACTION and VOLUME UP buttons (on the Monitor/Receiver) simultaneously, then press the ACTION and CHANNEL UP buttons (on the Monitor/Receiver) simultaneously. This will activate the Keyboard Lock feature. To deactivate, repeat procedure.

NOTE: There will be no On Screen display.

To confirm if the Keyboard Lock feature is activated, press any button (on the Monitor/Receiver) other than the POWER button (this button is never disabled).

Optional Equipment Connection and Operation

To Audio AMP Connection (Stereo)



- **To Audio AMP**

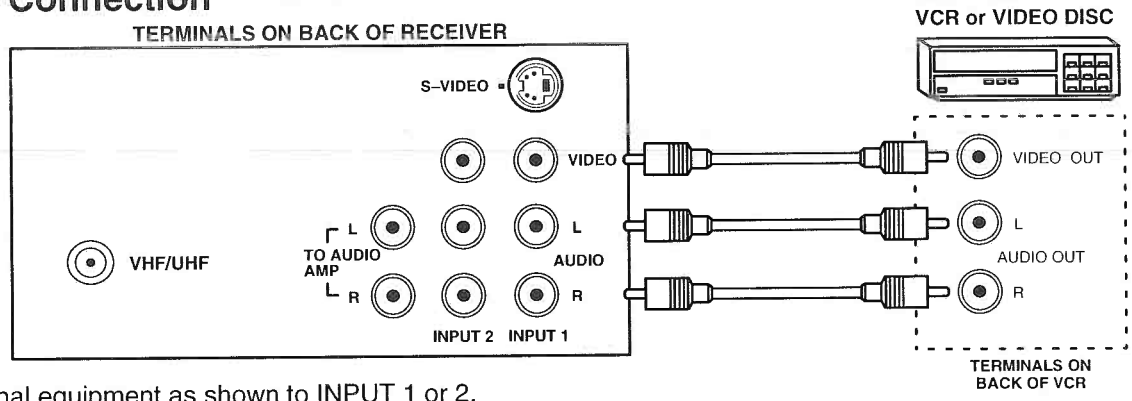
Connect to an external audio amp auxiliary input for monitoring sound through a stereo system.

NOTE: "TO AUDIO AMP" terminals cannot be used for external speakers.

Adjustment – When an audio amp is connected to "TO AUDIO AMP" terminals:

1. Select INT. SPEAKERS "ON " Mode. (Refer to the Audio Menu [TV] Speakers section.)
2. Set volume of audio amp to near minimum.
3. Adjust volume of TV to desired listening level.
4. Adjust volume of audio amp to match the level of TV.
5. Select INT. SPEAKERS "OFF" Mode. (Refer to the Audio Menu [TV] Speakers section.)
6. Audio bass, treble, balance, volume and mute can now be controlled by the TV Remote Control.

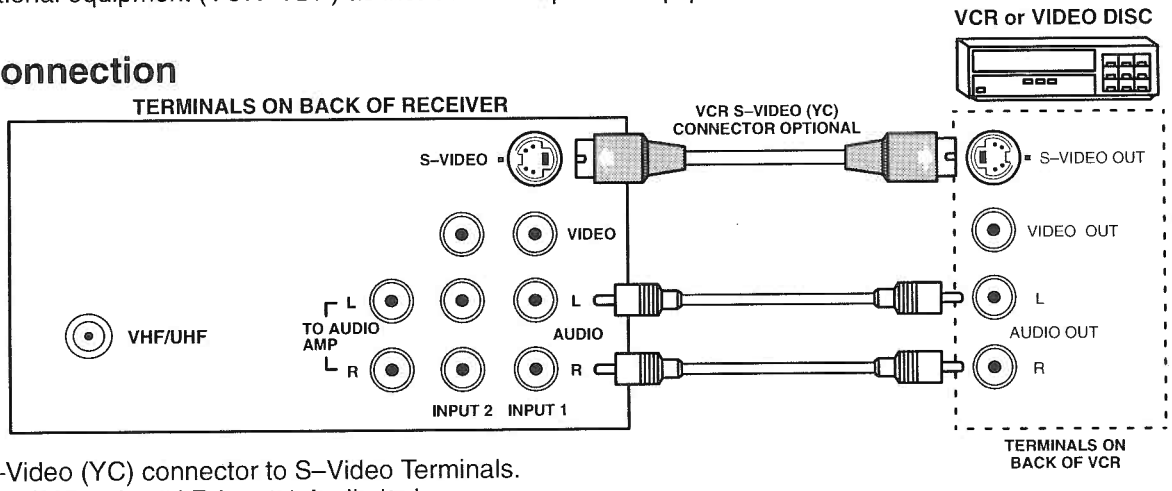
Video/Audio Connection



Operation:

1. Connect optional equipment as shown to INPUT 1 or 2.
2. Select the desired Video mode by pressing the TV/VIDEO button (or refer to the Input Selection Menu).
   NOTE: You must select the same VIDEO Mode that the equipment is connected to.
3. Operate optional equipment (VCR–VDP) as instructed in Optional Equipment manual.

S–Video Connection



Operation:

1. Connect S–Video (YC) connector to S–Video Terminals.
2. Make connections to L and R Input 1 Audio jacks.
3. Select Video1 mode by pressing the TV/VIDEO button (or refer to the Input Selection Menu).
4. Operate optional equipment (VCR–VDP) as instructed in Optional Equipment manual.

NOTE:

- You must select the same VIDEO Mode that the equipment is connected to.
- Connection of optional S–VIDEO jack automatically disconnects the Normal Video Input 1 jack.

Disassembly For Service

Back Cover

Remove all screws indicated by ◄ on back of set.

1. 5 screws around perimeter of cabinet.
2. 3 screws by A/V jacks.
3. 1 screw by AC line cord.

A–Board–Main Chassis

1. Slide chassis completely out.
   NOTE: Some tie–wraps securing wire dressings may have to be unfastened for chassis removal.
2. Stand chassis on it's edge. Now underside is completely accessible for component removal.

C–Board–CRT Output

1. Plugs into socket on CRT neck.

E–Board–Stereo/SAP Decoder

1. Is soldered into the main chassis (A–Board) at A21 and A22 connectors.

R–Board–Remote Receiver

1. Secured to cabinet escutcheon by plastic clips. Use small screwdriver to gently lift clips and pull board out.

X–Board–A/V 1 & 2 S–Video, TV Switching–Comb Filter

1. Plugs into main chassis A2, A3 and A4 sockets.
2. Has a ground wire that connects A14 to A–Board.

Z–Board–Pincushion Correction

1. Plugs into Main (A–Board) A7 socket.

3 Wire Line Cord

1. The line cord is soldered to the A–Board at M1, M2 & M4. The center Green wire is connected to M4. The ribbed wire connects to M1 and the smooth wire is connected to M2.

Disassembly for CRT Replacement

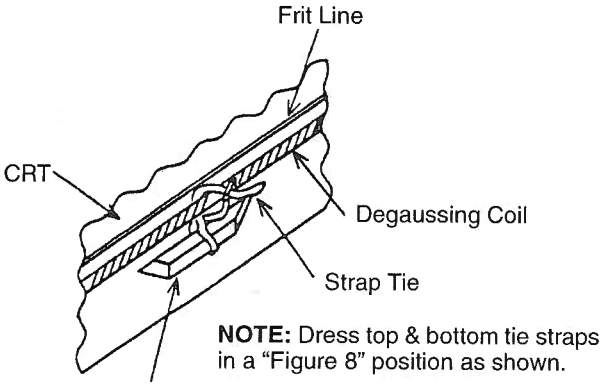
1. Discharge CRT as instructed in Safety Precautions.
2. Disconnect yoke plug, degaussing coil plug from main board and CRT 2nd anode button.
3. Remove C–Board from CRT base and unplug 2 black wires (CRT dag ground) C10 – 1, 2 from board.
4. Disconnect plugs A8, SP from A– Board.
5. Slide main chassis assembly completely out with CRT Board attached.

CRT Replacement

1. Perform DISASSEMBLY FOR CRT REPLACEMENT procedure.
2. Insure CRT H.V. anode button is discharged before handling CRT. See SAFETY PRECAUTIONS on handling the picture tube.
3. Remove components on CRT neck and place cabinet face down on a soft pad.
4. Note original order of CRT mounting hardware as you remove them from CRT mounting brackets at each corner of CRT.
5. Disconnect 2 dag ground connections to cabinet front.
6. Remove CRT with degaussing coil and dag ground braid attached.
7. Note original locations and mounting of degaussing coil and dag ground assembly to insure proper reinstallation on the replacement CRT.
8. To remove degaussing coil:
   - Cut 8 plastic ties that retain degaussing coil to CRT band. These ties must be replaced when installing degaussing coil on replacement CRT. (See detail).
9. To remove dag ground braid:
   - Unhook coil springs from lower CRT band. Release braid ends from upper left and upper right corner brackets.
10. Mount dag ground braid on replacement CRT. Replace degaussing coil with new ties. Dress coil using 2 plastic clamps from original CRT.

NOTE: The bottom of the top degaussing coil loop should be dressed at least 3–1/2" from CRT Anode button.

11. Replace components on CRT neck and re–install into cabinet. Make sure all ground wires and circuit board plugs get connected.


Frit Line
CRT
Degaussing Coil
Strap Tie
NOTE: Dress top & bottom tie straps in a "Figure 8" position as shown.
CRT Kick–out Detail

Purity and Convergence Procedure

Adjustment should be necessary only if the CRT or deflection yoke is replaced or if someone has disturbed the setting. The complete procedure consists of:

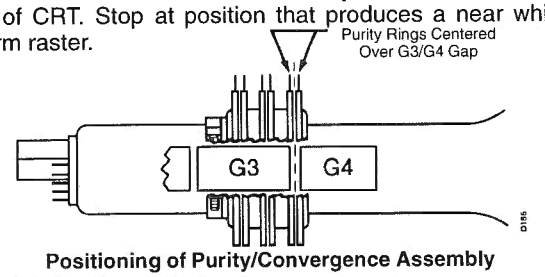
1. Initial static convergence
2. Setting purity
3. Final static convergence

When CRT or Yoke is Replaced

Place the yoke on the CRT neck (do not tighten clamp).

Position purity/convergence assembly as shown and tighten clamp snugly. Cut hot–melt glue seal on assembly and place like tabs of purity device together at 12 o'clock to reduce its magnetic field effect. Manually degauss CRT.

Turn Receiver ON and slide deflection yoke back and forth on neck of CRT. Stop at position that produces a near white, uniform raster.



Positioning of Purity/Convergence Assembly

Initial Center Static Convergence

Connect dot/crosshatch generator to Receiver and tune in signal. Observe misconvergence at center of screen only.

Adjust 4 pole magnet (center rings): separate tabs and rotate device to converge blue with red.

Adjust 6 pole magnet (rear rings): separate tabs and rotate device to converge blue and red (magenta) with green.
NOTE: Precise convergence at this point is not important.

Purity Adjustment

When in the Serviceman Mode for making electronic adjustments, Press the Remote Control (RECALL) button to enter Purity Check. (See Service Adjustments Electronic Controls.)

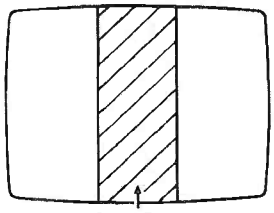
Operate the Receiver for 60 minutes using the first Purity check field (white screen) to stabilize the CRT.

Degauss the Receiver fully by using an external degaussing coil.

Press the Remote Control (RECALL) button again until the Purity Check (green screen) appears.

Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.

Adjust the front rings to set the vertical green raster precisely at the center of the screen. (Shown below.)



Green Raster

Slowly move the deflection yoke forward and adjust for the best overall green screen.

Tighten the deflection yoke clamp screw.

Press the Remote Control (RECALL) button again until the Purity Check (blue screen) and (red screen) appear and observe that good purity is obtained on each respective field.

Press the Remote Control (RECALL) button again until Purity check (white screen) appears. Observe the screen for uniform white. If not, repeat above procedure.

Final Convergence Procedure

NOTE: Before attempting convergence adjustment, vertical size, pincushion and focus adjustments must be completed. Connect a dot pattern generator to the set. The brightness level should be no higher than necessary to obtain a clear pattern.

Converge the red and blue dots at the center of the screen by rotating the 4 pole (R with B) Static Convergence Magnets.

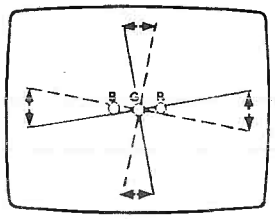
Align the converged red/blue dots with the green dots at the center of the screen by rotating the 6 pole (R/B with G) Static Convergence Magnets. Melt wax with soldering pencil to reseal magnets.

Slightly tilt (do not rotate) the deflection yoke vertically and horizontally to obtain good overall convergence.

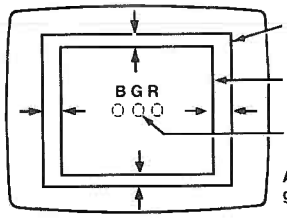
After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.

Secure deflection yoke by inserting side two wedges at 3 and 7 o'clock positions.

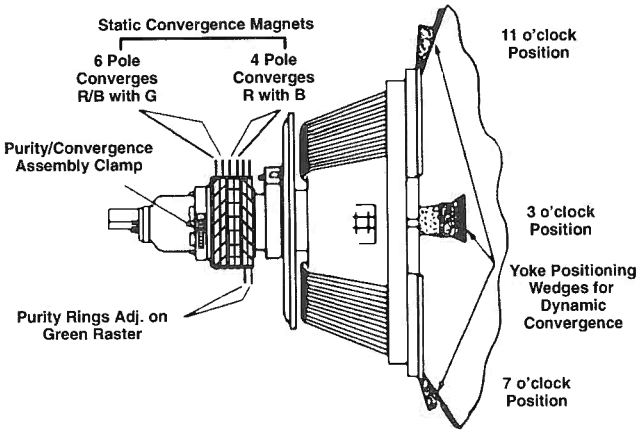
Apply adhesive between tab (thin portion) of wedge and CRT and place tape over tab to secure to CRT.



As the yoke is moved vertically, the rasters produced by the outside guns rotate in opposite directions.


B G R
Raster produced from one of the outside electron beams
Raster from the other outside electron beam
Static convergence magnets are set for center convergence

As the yoke is moved horizontally, one raster gets larger while the other gets smaller


Static Convergence Magnets
6 Pole Converges R/B with G
4 Pole Converges R with B
11 o'clock Position
Purity/Convergence Assembly Clamp
3 o'clock Position
Yoke Positioning Wedges for Dynamic Convergence
Purity Rings Adj. on Green Raster
7 o'clock Position

Permalloy Convergence Corrector Strip (Part No. OFMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required.

First converge the set without the strip and observe the corners.

If correction is needed:

1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.

Service Notes

IMPORTANT: To protect against possible damage to solid state devices due to arcing or static discharge, make certain all ground wires and CRT DAG wire are securely connected.

CAUTION: The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing to avoid damage to test equipment or chassis. Connect test equipment to correct ground (⏚) or (⏚) when servicing or incorrect readings will occur.

WARNING: This Receiver has been designed to meet or exceed applicable safety and X–radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X–radiation and shock and fire hazard, the parts indicated by the symbol ⚠ on the schematic must be replaced with identical replacement parts. Order parts from the manufacturer's parts center using numbers shown in this service manual or give complete chassis number and part reference number.

For optimum performance and reliability, all other parts should be replaced with components having identical specifications.

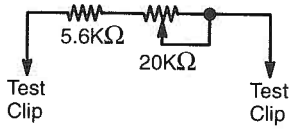
Horiz Hold Down Circuit

This chassis employs a special circuit to protect against excessive high voltage and beam current. If for any reason the high voltage and beam current exceed a predetermined amount, this circuit operates and detunes the horizontal oscillator. As a result, the horizontal looses sync and if high voltage or beam current varies significantly the video is interrupted to blank the screen. This limits high voltage.

The Horizontal Hold Down protection circuit is not adjustable. However, if components indicated by the symbol ⚠ on the schematic in either the horizontal sweep system or the Hold Down protection circuit itself are changed the operation of the circuit should be checked using the following procedure.

Equipment needed:

1. Signal Generator with crosshatch pattern.
2. Digital Voltage Meter
3. High Voltage Meter (0V–50KV)
4. Variac and Isolation Transformer
5. HHS test jig made with 20KΩ potentiometer and 5.6KΩ resistor with test clips as shown.



Preparation

1. Connect Receiver through variac and isolation transformer to AC line. Set variac to 120V AC.
2. Connect signal generator with crosshatch pattern.
3. Connect DVM (+) to TPD1 and (–) to TPD2 (A–Board)
4. Connect High Voltage Meter to 2nd anode under rubber cup on CRT.
5. Turn Receiver ON and confirm that horizontal is in sync.
6. Use the Picture Icon Menu to adjust Brightness and Picture video adjustments for a DVM reading between 0.5V and 1V. (This condition exists when the crosshatch pattern is just viewable on the screen.)
7. Turn Receiver OFF. Connect the HHS test jig to IC801 Pin 1 and Pin 2. Test jig potentiometer should be set to maximum resistance.
8. Turn Receiver ON. Slowly reduce the potentiometer resistance until the horizontal just begins to pull out of sync.
9. Observe the High Voltage meter. HIGH VOLTAGE should read less then 34.8KV at point where horizontal sync is lost.
10. Turn Receiver OFF. Disconnect test jig and meter leads from chassis.

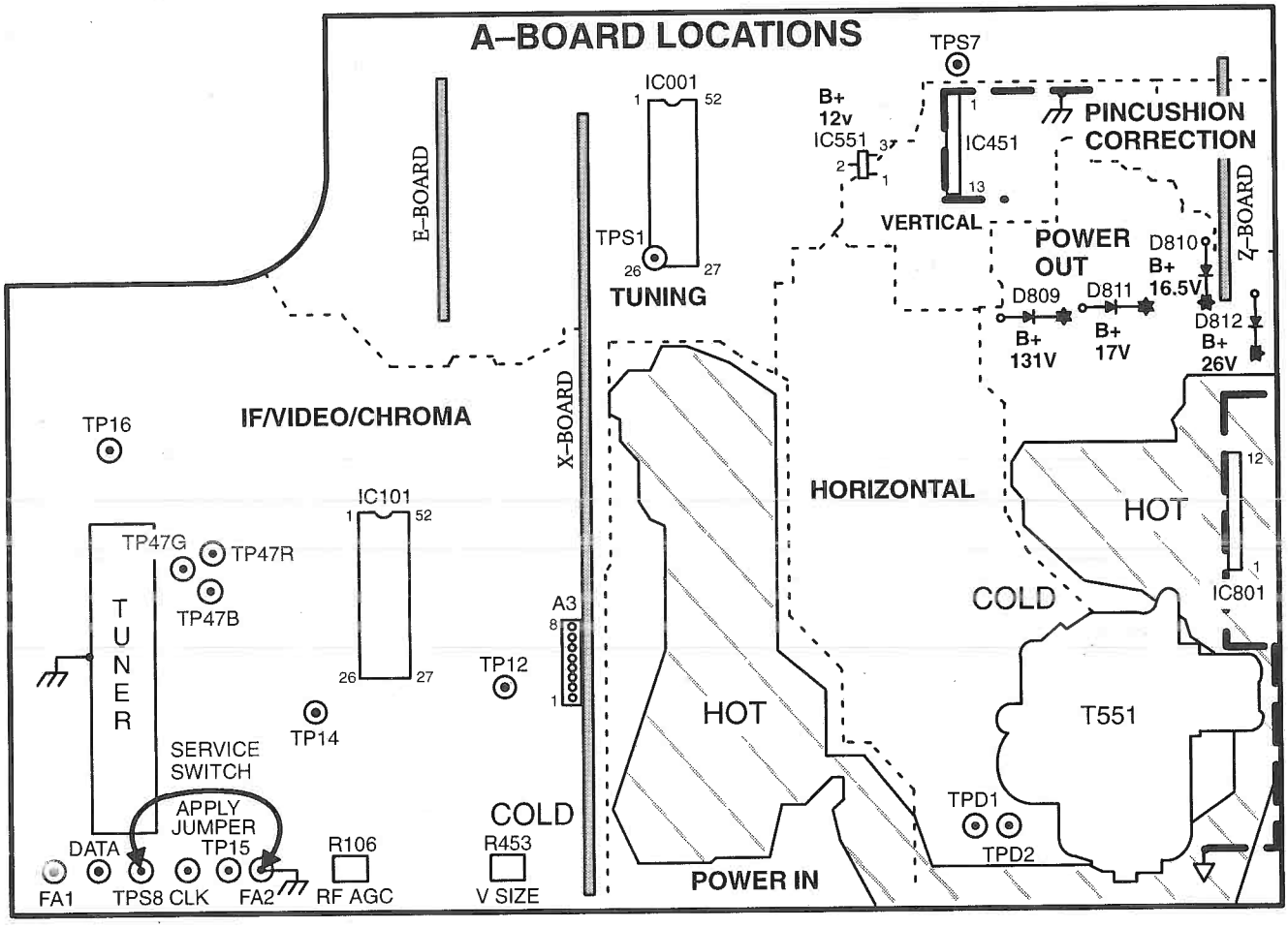
CAUTION:

If High Voltage is not within the specified limit, the cause must be determined before the Receiver is returned to the owner.

Service Adjustment Procedures

ALL SERVICE ADJUSTMENTS ARE FACTORY PRESET AND SHOULD NOT REQUIRE ADJUSTMENT UNLESS CONTROL AND/OR ASSOCIATED COMPONENTS ARE REPLACED.

NOTE: CONNECT MINUS LEAD OF VOLTMETER TO CORRECT GROUND FOR CIRCUIT BEING CHECKED. WHEN NECESSARY TO USE A LINE OPERATED GROUND, THE GROUND INDICATION (⏚) WILL BE INDICATED. FOR THIS GROUND, USE IC801 HEAT SINK. FOR ALL OTHER CIRCUITS, CONNECT MINUS LEAD OF VOLTMETER TO LINE ISOLATED GROUND (⏚)TUNER SHIELD, IC451 HEAT SINK OR FA2.



131.0V B+ Voltage Confirmation

1. Set BRIGHT and PICTURE by using Picture Menu to Minimum.
2. Connect a DVM between cathode of D809 and cold ground (⏚) FA2.
3. Confirm that B+ voltage is 131.0V ±1.0V. This voltage supplies B+ to Horizontal Output & Flyback circuits.

Source Voltage Chart

120V AC line input. BRIGHT and PICTURE of Picture Menu adjusted to Minimum. Use cold ground (⏚) for minus lead of DVM.

Pin 3 of IC551	+12.0V ±1V
Cathode of D810	+16.5V ±2V
Cathode of D811	+17.0V ±2V
Cathode of D812	+26.0V ±2V
Cathode of D554	+220V ±15V

Adjust Picture Menu for normalized video adjustments.

B+ 5V Source Voltages

Volatile 5V:

Cathode D557 = Tuner BP, IC101 (B+ V_{cc}), RF AGC (R106)

MPU 5V:

Emitter Q002 = IC001(V_{DD}), IC003

Standby 5V:

Cathode D006 = Keyboard, IC001 (Key in 1, I^2C EE-PROM (IC002), TIMER L.E.D, Remote Receiver

B+ 9V Source Voltage

Cathode D560 = IC101 (B+ V_{cc}) (HOLD DOWN) (AFC OUT),Q306 – Q305 (Video), Q307 (Closed Caption E.F.), IC001 (Audio Control B/T/B).

B+ 12V (Stand–by)

Cathode D001 = RL001 (on–off relay), Q002 (+5V Reg), IC101 (Horiz. Vcc).

High Voltage Check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Adjust BRIGHTNESS and PICTURE using Picture Icon Menu so video just disappears
3. Confirm B+ 131V is within limit.
4. Using a calibrated high voltage meter confirm that High Voltage is 29.25kV ±1.25kV.

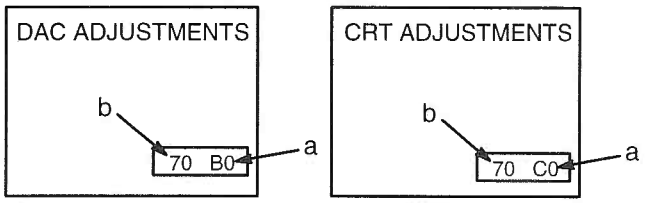
Serviceman Mode (Electronic Controls)

This chassis has new electronic technology using the I^2C Bus Concept.The system usually performs as a control function and replaces many of the required mechanical controls. Instead of adjusting various mechanical controls individually, many of the control functions are now performed electronically by using "On Screen Menu". (The Serviceman Adjustment Mode.)

NOTE: It is suggested that a serviceman read all the way through and understand the following procedure for Entering/Exiting the Serviceman Adjustment Mode; then proceed to follow the instructions working with the Receiver. After a person is familiar with this adjustment procedure, use the Instructional Flow Chart for Serviceman Mode as a quick guide.

Entering Serviceman Mode:

1. While the Receiver is ON and operating in Normal Mode, momentarily short test point FA1 to cold ground (⏚) FA2.
   "The Monitor enters the Aging Mode".
   (The VOLUME UP/DOWN will adjust rapidly.)
2. **Press** ACTION button and VOLUME UP button on Receiver Control Panel simultaneously.
   "The Monitor enters the Servicemans Mode".
   (The VOLUME UP/DOWN will adjust normally.)
   (All customer controls are set to a nominal level.)
3. **Press** the POWER button on the Remote Control to select one of three Serviceman Adjustment Modes.
   - B = Serviceman DAC ADJUSTMENTS
   - C = Serviceman CRT ADJUSTMENTS
   - Normal TV = Normal operation of Channel ▲▼ and Volume ▲▼



An Address Menu appears in the bottom right hand corner of the screen.

For DAC Adjustments:

a.) Press
CHANNEL UP/DOWN or DIAMOND UP/DOWN on the Remote Control to select any of 6 Service Adjustment Addresses.

Important Note: Write down the original value (b in detail) for each address adjustment before adjusting anything. It is easy to adjust the wrong item.

b.) Press
VOLUME UP/DOWN or DIAMOND RIGHT/LEFT on the Remote Control to adjust the level of the selected Service Adjustment.

BO = Sub Bright
↓
B1 = Sub Color
↓
B2 = Sub Tint
↓
B3 = Sub Picture
↓
B4 = Video Det. Level
↓
B5 = Sound Output

Adjustment Range and Default level values for Service Adj.

Service Adjustment	Adj Range	Default Level
Sub Bright (BO)	0 ~ 127	97
Sub Color (B1)	0 ~ 63	33
Sub Tint (B2)	0 ~ 63	33
Sub Picture (B3)	0 ~ 63	21
Video Detector Level (B4)	0 ~ 15	8
Sound Out (B5)	0 ~ 15	8

Press the POWER button on the Remote Control to select Serviceman CRT Adjustment Mode.

For CRT Adjustments:

a.) Press
CHANNEL UP/DOWN or DIAMOND UP/DOWN on the Remote Control to select any of 6 Service Adjustments.

Important Note: Write down the original value (b in detail) for each address adjustment before adjusting anything. It is easy to adjust the wrong item.

b.) Press
VOLUME UP/DOWN or DIAMOND RIGHT/LEFT on the Remote Control to adjust the level of the selected Service Adjustment.

CO = Horiz. Center
↓
C1 = RED Cutoff
↓
C2 = GRN Cutoff
↓
C3 = BLU Cutoff
↓
C4 = RED Drive
↓
C5 = BLU Drive

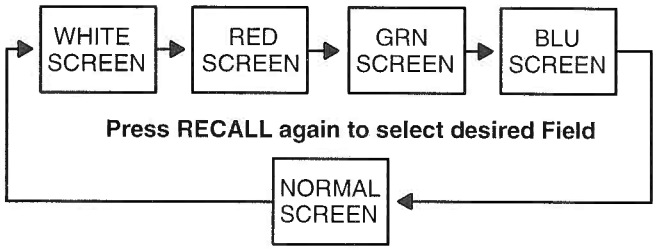
Adjustment Range and Default level values for Service Adj.

CRT Adjustment	Adj Range	Default Level
Horiz Centering (C0)	0 ~ 15	8
RED Cutoff (C1)	*0 ~ 511	128
GRN Cutoff (C2)	*0 ~ 511	128
BLU Cutoff (C3)	*0 ~ 511	128
RED Drive (C4)	0 ~ 255	128
BLU Drive (C5)	0 ~ 255	128

*Adjustment indicated in 2 steps (0 ~ 255) ➡ (H0 ~ H255)

To Check Purity:

Press the RECALL button on the Remote Control to enter Purity Field Check Mode.
NOTE: Must be in Serviceman Mode to get color.



IMPORTANT NOTE:
Always Exit Serviceman Mode After Use.

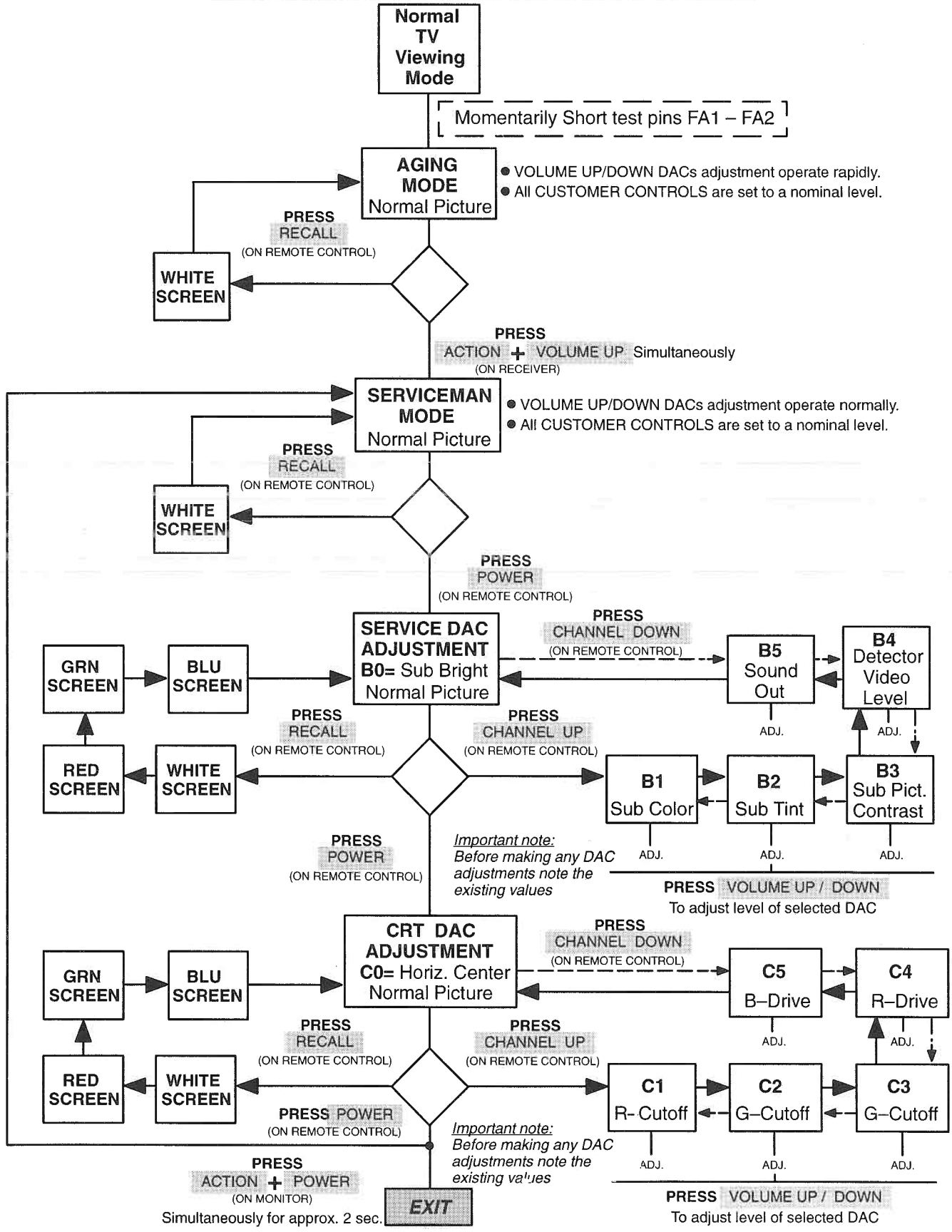
Exit Serviceman Mode:

1. Press ACTION + POWER buttons simultaneously for approximately 2 seconds.
   "The Monitor exits Serviceman Mode".

The Receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound.

Instructional Flow Chart for Serviceman Mode

Caution: Always EXIT Serviceman Mode after use


Normal TV Viewing Mode
Momentarily Short test pins FA1 – FA2
AGING MODE Normal Picture
● VOLUME UP/DOWN DACs adjustment operate rapidly.
● All CUSTOMER CONTROLS are set to a nominal level.
PRESS RECALL (ON REMOTE CONTROL)
WHITE SCREEN
PRESS ACTION + VOLUME UP Simultaneously (ON RECEIVER)
SERVICEMAN MODE Normal Picture
● VOLUME UP/DOWN DACs adjustment operate normally.
● All CUSTOMER CONTROLS are set to a nominal level.
PRESS RECALL (ON REMOTE CONTROL)
WHITE SCREEN
PRESS POWER (ON REMOTE CONTROL)
SERVICE DAC ADJUSTMENT B0= Sub Bright Normal Picture
PRESS CHANNEL DOWN (ON REMOTE CONTROL)
B5 Sound Out
B4 Detector Video Level
ADJ.
ADJ.
GRN SCREEN
BLU SCREEN
RED SCREEN
WHITE SCREEN
PRESS RECALL (ON REMOTE CONTROL)
PRESS CHANNEL UP (ON REMOTE CONTROL)
B1 Sub Color
B2 Sub Tint
B3 Sub Pict. Contrast
ADJ.
ADJ.
ADJ.
PRESS POWER (ON REMOTE CONTROL)
Important note: Before making any DAC adjustments note the existing values
PRESS VOLUME UP / DOWN
To adjust level of selected DAC
CRT DAC ADJUSTMENT C0= Horiz. Center Normal Picture
PRESS CHANNEL DOWN (ON REMOTE CONTROL)
C5 B–Drive
C4 R–Drive
ADJ.
ADJ.
GRN SCREEN
BLU SCREEN
RED SCREEN
WHITE SCREEN
PRESS RECALL (ON REMOTE CONTROL)
PRESS CHANNEL UP (ON REMOTE CONTROL)
C1 R- Cutoff
C2 G–Cutoff
C3 G–Cutoff
ADJ.
ADJ.
ADJ.
PRESS POWER (ON REMOTE CONTROL)
Important note: Before making any DAC adjustments note the existing values
PRESS ACTION + POWER (ON MONITOR)
Simultaneously for approx. 2 sec.
EXIT
PRESS VOLUME UP / DOWN
To adjust level of selected DAC

Receiver/Monitor shuts off; then turns on, TUNED TO CHANNEL 3 WITH A PRESET LEVEL OF SOUND.
Note: This will also erase any Programmed Channels, Channels Caption data and some other user defined items.

Service Adjustments (Electronic Control)

Sub–Brightness

Serviceman DAC Adjustment (B0)

Adjustment of this control is important for getting proper operation of customer brightness and picture controls. This adjustment must be made after Sub–Contrast or Color Temperature adjustments are made. **Do not adjust** SCREEN after Sub–Brightness is set.

Preparation

1. Connect a color bar signal with 100 IRE white and 7.5 IRE black. (Switch Color "OFF" on the generator.) Operate television for a minimum of 10 minutes prior to the adjustment.

Procedure

1. In Serviceman Mode for making electronic adjustments, select DAC adjustment (B0) and adjust so the black bar starts to look grey. Then decrease the adjustment to the point where grey turns to black.

Video Detector Level

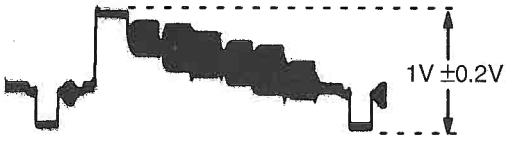
Serviceman DAC Adjustment (B4)

Preparation

1. Obtain an NTSC color bar pattern with 100 IRE white and 87.5% modulation.
2. Connect oscilloscope to TP12. Use cold ground for scope connection. Set scope at Horizontal rate (20μs) time base.

Procedure

1. In Serviceman Mode for making electronic adjustments, select DAC Adjustment (B4) and adjust for 1V from sync tip to white level. See detail.



2. Set SUB–CONTRAST adjustment (DAC adjustment B3).

Sub Contrast

Serviceman DAC Adjustment (B3)

This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT Board or the CRT is replaced.

Preparation

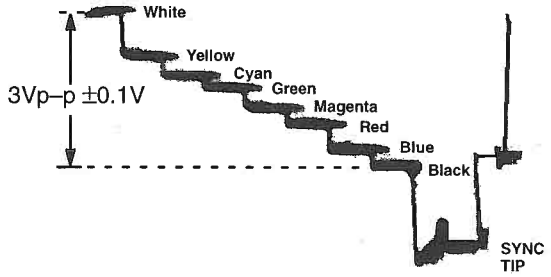
1. Connect a generator pattern with 87.5% modulation, 70% saturated color bar with a 100 IRE white and 7.5 black.

NOTE: The pattern used in this procedure is an EIA color bar pattern with 87.5% modulation with 100 IRE white and 7.5 black. Correlate the information in this procedure to your pattern used.

2. Connect oscilloscope to CRT–Board connector C1–2. Set scope horizontal time base to 20μs (horizontal).
3. Connect jumper from TPD2 to ground (⏚).

Procedure

1. In the Serviceman Mode for electronic adjustments, select DAC Adjustment (B3) and adjust for 3Vp–p ±0.1V from white level to black level on video waveform (see video waveforms detail).



2. Remove jumpers (Preparation step 3).

Tint/Color Adjustment

Serviceman DAC Adjustment (B2) (B1)

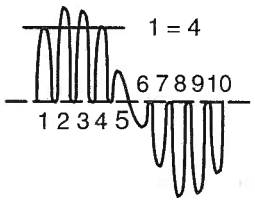
Preparation

1. Connect a rainbow color bar signal.
2. Connect oscilloscope to TP47R (A–Board) or connector C1 pin 1 (CRT–Board).
3. Connect 1K ohm resistor jumper between IC551 pin 3 (+12V) and TPD1.
4. Connect jumper from TPD2 to GND (⏚).

Procedure

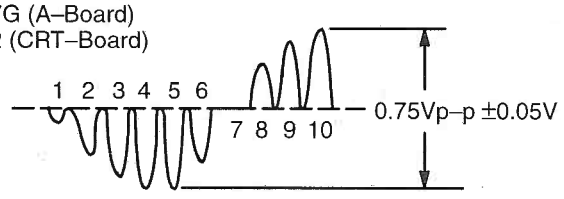
1. In serviceman Mode for making electronic adjustments, select DAC Adjustment (B2) and adjust waveform so peak 1 is the same as peak 4 as shown in the detail.

TP47R (A–Board)
C1–1 (CRT–Board)



2. Connect oscilloscope to TP47G (A–Board) or connector C1 pin 2 (CRT–Board).
3. Select DAC adjustment (B1) and adjust for peak to peak waveform to be 0.75V p–p ±0.05V.

TP47G (A–Board)
C1–2 (CRT–Board)



4. Remove jumpers (Preparation step 3).

Color Temperature Adjustment (B/W Tracking)

Serviceman DAC Adjust. (C1) (C2) (C3) (C4) (C5)
Minor Touch–Up Method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for "good grey scale and warm highlights".

- LOW LIGHT areas – In Serviceman Mode for making electronic adjustments, select cutoff (C1) RED, (C2) GRN, (C3) BLU and adjust picture for grey.
- HIGH LIGHT areas – In Serviceman Mode for making electronic adjustments, select Drive (C4) RED, (C5) BLU and adjust for warm whites.

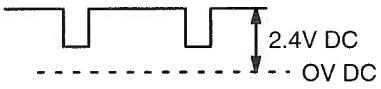
Complete Adjustment

Preparation

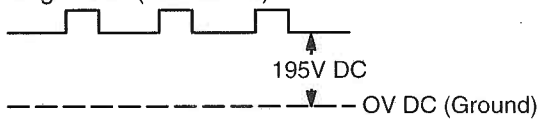
1. Turn Receiver "ON" and allow 10 minutes warm up at high brightness.
2. Apply color bar signal with color "OFF".
3. Turn SCREEN control (part of FBT T551) fully counterclockwise.

Procedure

1. Connect oscilloscope to TP35 (CRT–Board).
2. In Serviceman Mode for making electronic adjustment, select Sub Bright (B0).
3. Connect jumper from TPS8 to FA2 (Ground ⏚).
4. Observe oscilloscope waveform at Horizontal rate and adjust Serviceman Mode Sub Bright DAC (B0) for scanning period of 2.4V above DC ground shown in detail.



5. Remove jumper. (Step 3)
6. Connect scope to GRN Cathode (KG) on CRT–Board.
7. In Serviceman Mode for making electronic adjustments, select GREEN CUTOFF DAC (C2).
8. Connect jumper from TPS8 to FA2.
9. View scope trace at Horizontal rate and adjust Serviceman Mode DAC (C2) for the scanning period to be 195V above DC ground. (See detail)
10. Remove jumper. (Step 8)
11. Connect scope to RED Cathode (KR).
12. In Serviceman Mode for making electronic adjustments, select RED CUTOFF DAC (C1).
13. Connect jumper from TPS8 to FA2.
14. View scope trace and adjust Serviceman Mode DAC (C1) for the scanning period to be 195V above DC ground. (See detail)
15. Remove jumper. (Step 13)
16. Connect scope to BLU Cathode (KB).
17. In Serviceman Mode for making electronic adjustments, select BLU CUTOFF (C3).
18. Connect jumper from TPS8 to FA2.
19. View scope trace and adjust Serviceman Mode DAC (C3) for the scanning period to be 195V above DC ground. (See detail)



Adjustment Waveform Detail (Steps 9, 14, 19)

20. Turn Screen Control (part of FBT) slowly clockwise until a color horizontal line appears.
21. With the other two colors Serviceman Mode DAC CUTOFF adjustments (C1) RED, (C2) GRN, (C3) BLU; increase their colors to create a white horizontal line.
22. Remove jumper. (Step 18)
23. Confirm good gray scale by viewing B/W color bar pattern.
24 In Serviceman Mode for making electronic adjustments select DAC DRIVE adjustments (C4) RED, (C5) BLU and adjust for warm white in white color bar of pattern.
25. EXIT Serviceman MODE.
26. Adjust Picture Menu Video Adjustments BRIGHT and PICTURE from low scale to high scale and check Black and White tracking.
27. If correction needed: Re–Enter Serviceman Mode and perform **Minor Touch – Up Method.**
28. Perform SUB BRIGHTNESS adjustment procedure.

Horizontal Centering

Serviceman DAC Adjustment (C0)

Preparation

1. Connect crosshatch generator.

Procedure

1. In Serviceman Mode for making electronic adjustments. Select DAC adjustment (C0) and adjust so center of crosshatch pattern is centered on CRT screen.
2. EXIT Serviceman Adjustment Mode.

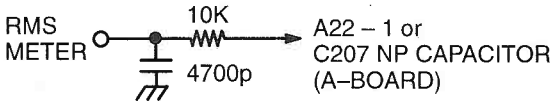
Sound Out

Serviceman DAC Adjustment (B5)

This adjustment is factory set and needs to be performed only when IC002 or IC101 is replaced.

Preparation

1. Connect 400Hz. 100% modulation (25KHz deviation) signal generator to antenna (70db ±5db, 75Ω open P/S 10db). Generator pre–emphasis must be "OFF" for 1KHz.
2. Connect RMS Meter with filter jig as shown in detail.



Procedure

1. In Serviceman Mode for making electronic adjustments, select DAC adjustment (B5) and adjust for RMS meter reading of 150mV rms ±5mVrms.
2. EXIT Serviceman Adjustment Mode.

Service Adjustments (Mechanical Controls)

RF AFC Delay R106

Adjust only if overloading on strong signal or busy background (snow) is present on moderate strength signals.

1. Adjust RF AGC control R106 until snow appears in picture, then adjust control until snow is eliminated.
2. Check all channels for optimum setting.

AFC Field Adjustment L103

1. Select TV signal mode with Menu.
2. Defeat AFC by applying jumper from TPS7 to ground (⏚).
3. Connect a digital voltmeter to AFC test point TP16.
4. Use Remote Control toCheck all active High Band channels 7~13 for AFC voltage range. Select channel with AFC voltage in approximate center of voltage range.
5. Adjust L103 for 4.6V ±0.5V at TP16.
6. Check all active channels for proper AFC correction. Touch up L103 if required. Remove jumper in step 2.

NOTE: Do not use TV/CABLE channel with offset carriers for adjustment or in determination of low and high range of AFC voltage.

Sound Alignment L201

1. Select active TV channel.
2. Attenuate signal (loosely couple antenna lead or use RF attenuator pad) for noisy sound.
   - Adjust L201 for maximum sound. Signal to noise ratio is best when L201 is peaked.
3. Connect antenna or remove RF attenuator for strong signal.

Comb Filter Adjustment – R3215 and L3202 (X–Board)

1. Connect an NTSC color bar generator (not rainbow generator) to video Input.
2. Normalize Picture Menu Video Adjustments. Then adjust SHARPNESS to Max. and COLOR to Min.
3. Connect an oscilloscope to any of the following: Connector A3 pin 5 (A–Board), TP47G (CRT–Board) or TP35 (CRT–Board).
4. Set oscilloscope sweep rate to view color burst signal on horizontal sync pulse.
5. Set BALANCE control R3215 fully clockwise. Burst amplitude should increase making it more visible.
6. Adjust phase coil L3202 for Minimum burst amplitude.
7. Re–adjust BALANCE control R3215 for Minimum burst amplitude.
8. Repeat procedure steps 6 & 7.

Vertical Size R453

1. Turn VERTICAL SIZE control R453 CCW until top and bottom edges of raster are visible.
2. Adjust VERTICAL SIZE control CW until top and bottom of raster touch bezel edge. Advance SIZE control CW an additional 30 degrees. This will be approximately 10% overscan. Linearity adjustment is automatic with size adjustment.

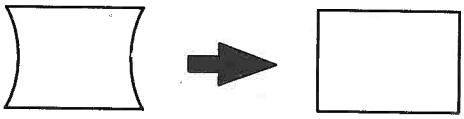
Pincushion Correct (R761) & Horizontal Width (R760) Z–Board

Preparation

1. Connect crosshatch pattern generator.
2. Normalize the PICTURE Menu Video Adjustments.
3. Adjust Horizontal Width (R760) to MID position.

Procedure

1. Adjust Pincushion Correct Control (R761) for the straightest left and right vertical lines.



2. If needed, adjust Horizontal Width (R760). Adjust for equal horizontal size of right side and left side boxes.

Focus (Part of T551)

Preparation

1. Connect Signal generator and select dot pattern.

Procedure

1. Adjust the FOCUS control to obtain the sharpest and clearest dot pattern.
   (a) adjust for best center
   (b) adjust for best area between center and top right corner.

MPU Reference Oscillator C031

Preparation

1. Connect frequency counter from TPS1 to cold ground (⏚).

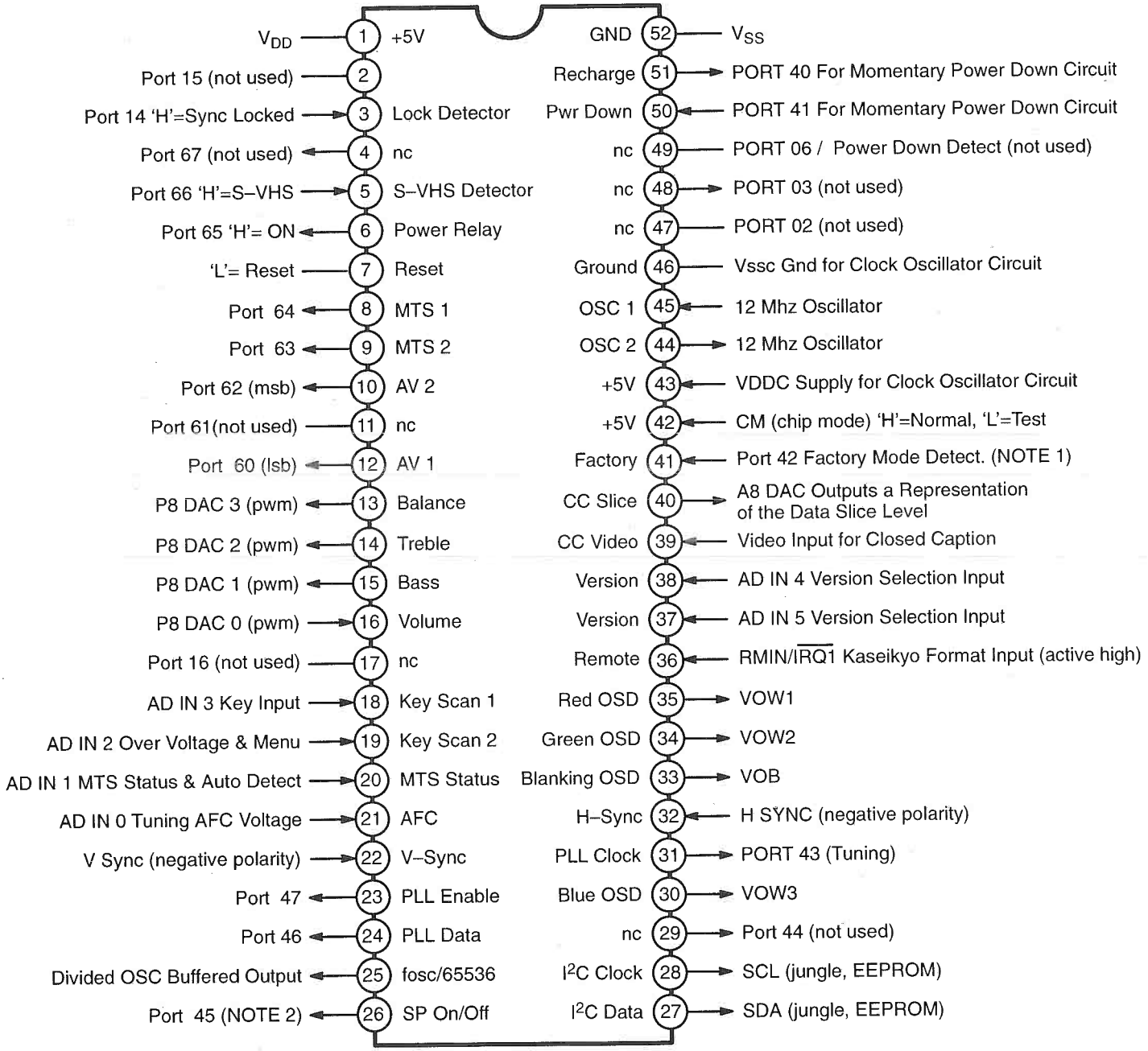
NOTE: Frequency counter probe capacitance should be 8PF or less.

Procedure

1. Turn Receiver "OFF" with AC power applied.
2. Adjust trimmer capacitor C031 for 5461.333µsec ±.033µsec (12MHz ±72Hz).

New Circuits

IC001 MPU IN/OUT Pins and Functions

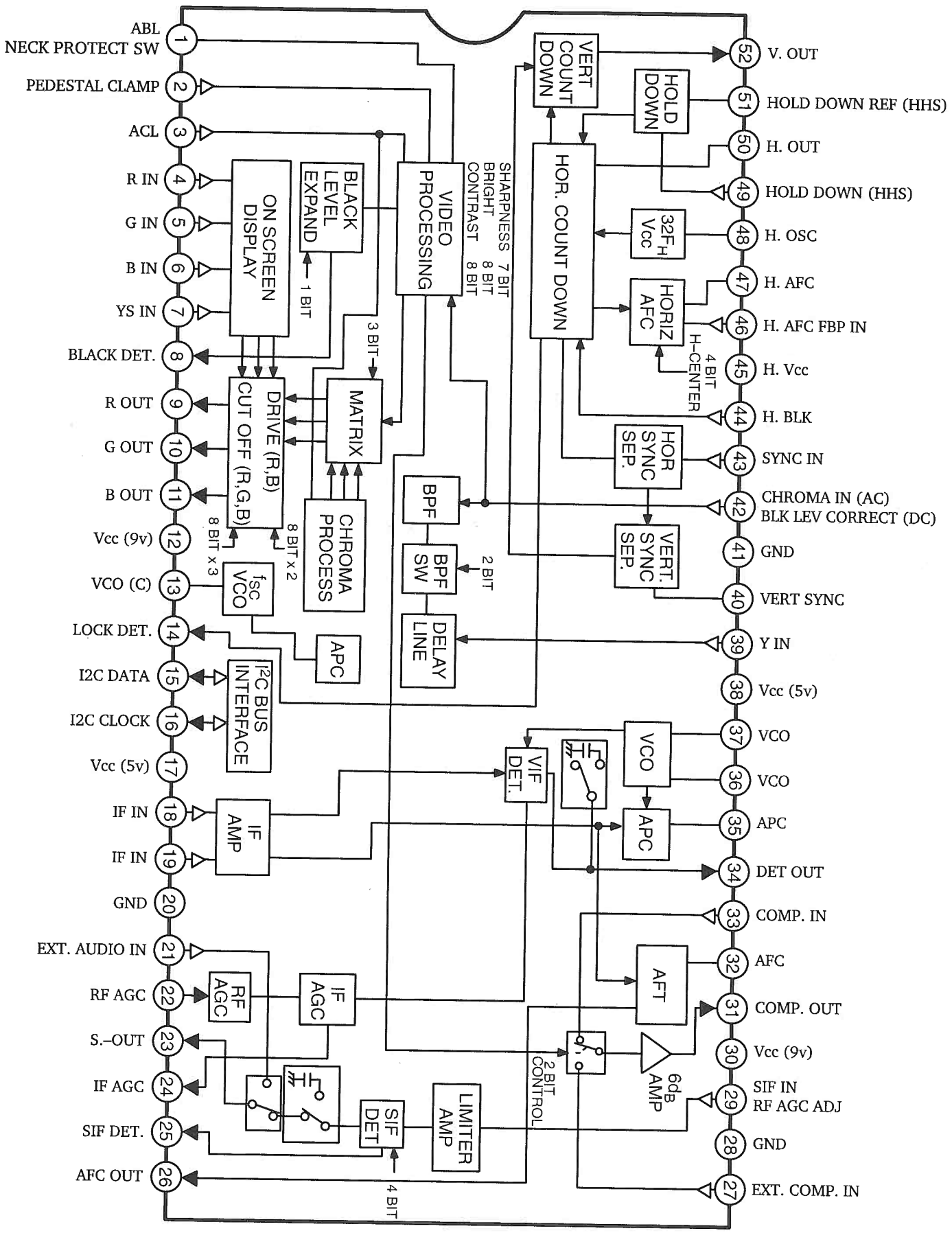

VDD 1 +5V
Port 15 (not used) 2
Port 14 'H'=Sync Locked 3 Lock Detector
Port 67 (not used) 4 nc
Port 66 'H'=S-VHS 5 S-VHS Detector
Port 65 'H'= ON 6 Power Relay
'L'= Reset 7 Reset
Port 64 8 MTS 1
Port 63 9 MTS 2
Port 62 (msb) 10 AV 2
Port 61(not used) 11 nc
Port 60 (lsb) 12 AV 1
P8 DAC 3 (pwm) 13 Balance
P8 DAC 2 (pwm) 14 Treble
P8 DAC 1 (pwm) 15 Bass
P8 DAC 0 (pwm) 16 Volume
Port 16 (not used) 17 nc
AD IN 3 Key Input 18 Key Scan 1
AD IN 2 Over Voltage & Menu 19 Key Scan 2
AD IN 1 MTS Status & Auto Detect 20 MTS Status
AD IN 0 Tuning AFC Voltage 21 AFC
V Sync (negative polarity) 22 V-Sync
Port 47 23 PLL Enable
Port 46 24 PLL Data
Divided OSC Buffered Output 25 fosc/65536
Port 45 (NOTE 2) 26 SP On/Off
GND 52 VSS
Recharge 51 PORT 40 For Momentary Power Down Circuit
Pwr Down 50 PORT 41 For Momentary Power Down Circuit
nc 49 PORT 06 / Power Down Detect (not used)
nc 48 PORT 03 (not used)
nc 47 PORT 02 (not used)
Ground 46 Vssc Gnd for Clock Oscillator Circuit
OSC 1 45 12 Mhz Oscillator
OSC 2 44 12 Mhz Oscillator
+5V 43 VDDC Supply for Clock Oscillator Circuit
+5V 42 CM (chip mode) 'H'=Normal, 'L'=Test
Factory 41 Port 42 Factory Mode Detect. (NOTE 1)
CC Slice 40 A8 DAC Outputs a Representation of the Data Slice Level
CC Video 39 Video Input for Closed Caption
Version 38 AD IN 4 Version Selection Input
Version 37 AD IN 5 Version Selection Input
Remote 36 RMIN/IRQ1 Kaseikyo Format Input (active high)
Red OSD 35 VOW1
Green OSD 34 VOW2
Blanking OSD 33 VOB
H-Sync 32 H SYNC (negative polarity)
PLL Clock 31 PORT 43 (Tuning)
Blue OSD 30 VOW3
nc 29 Port 44 (not used)
I2C Clock 28 SCL (jungle, EEPROM)
I2C Data 27 SDA (jungle, EEPROM)

NOTE 1:
Momentarily pulling pin 41 to ground and releasing it will put the microprocessor into factory aging mode. Holding this line at ground will inhibit microprocessor access to I^2C bus line.

NOTE 2:
Speaker On/Off is also used as audio defeat line.

IC101 Block Diagram

INPUT PINS = ▽ △ OUTPUT PINS = ▲ ▼

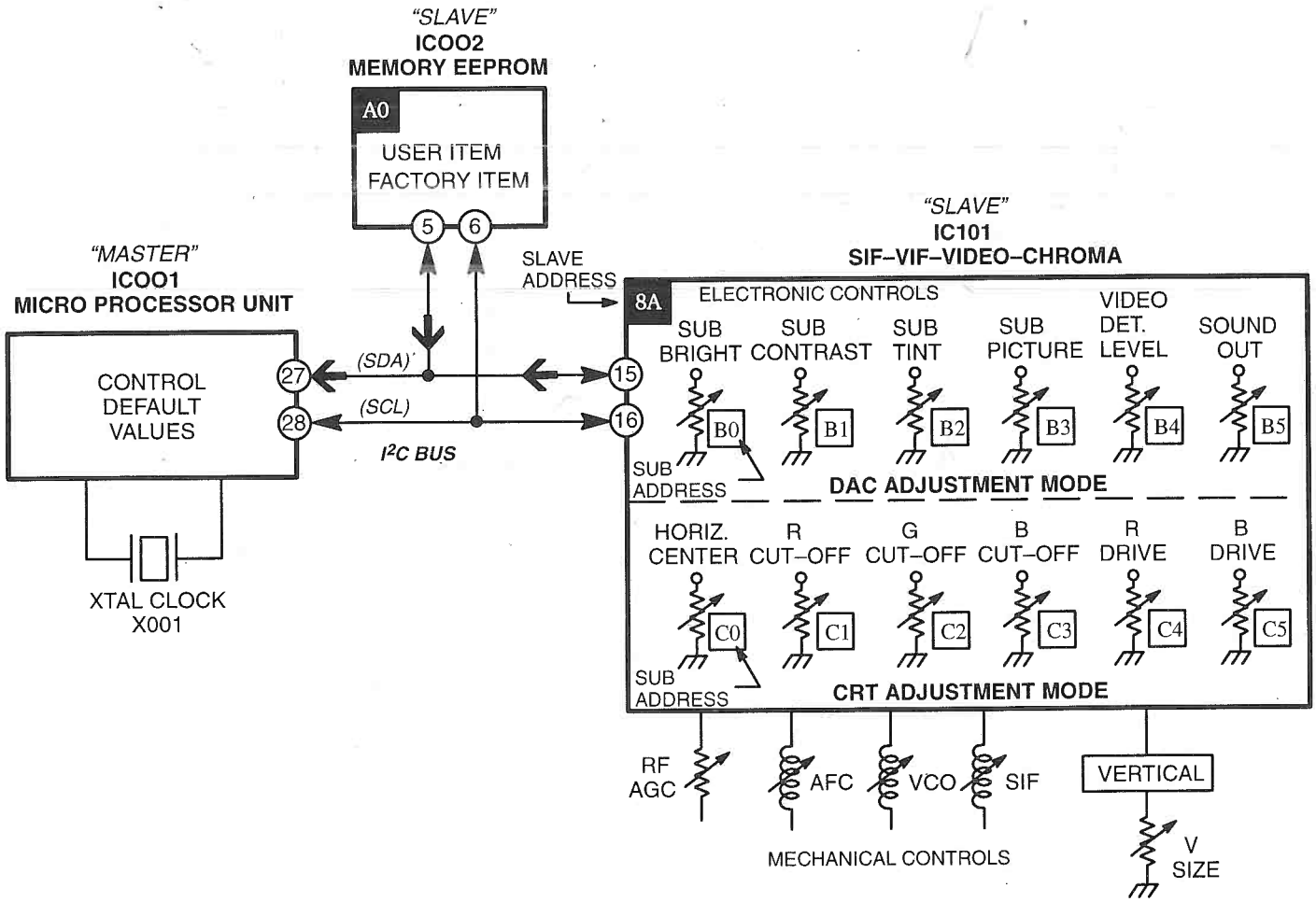


I²C Bus Line System

This Receiver makes use of one of the latest electronic technologies by using an I²C (Inter–Integrated Circuit) Bus Line Concept. Two wires, SDA (Serial Data) and SCL (Serial Clock), carry information between devices connected to the Bus. Each device connected to the Bus has a unique address for receiving data information (a Receiver) from a source (the Transmitter).

The devices are also considered to be a "Master" or a "Slave" when data is transmitted or received. In this Receiver, the "Master" (Micro Processor Unit,IC001) is the device which initiates a data transfer in the Bus line and generates the clock signal required to permit the data to be sent. The "Slaves" (MEMORY I²C EEPROM, IC002 and VIF–SIF–VIDEO–CHROMA JUNGLE, IC101) are the devices addressed by the MPU and receive the data transmitted.

This system usually performs as a control function and replaces many of the required mechanical controls needed in a television receiver. Instead of adjusting various mechanical controls individually, many of the control functions can be performed electronically using "On Screen Menus", (The Serviceman Mode).



Switching Power Supply

B+ source voltages are produced at the secondary of T801 by high frequency switching of a MOSFET transistor inside IC801. Also included in the STK730–020 package is an Amplifier, Error Detector and Over Current Protection circuit. Altogether, these circuits produce a semi regulated off line power supply circuit which require few external parts.

Operation

The switching action is done in the following way:

Starter voltage from the bridge rectifier is applied to IC801 pin 4 (the Gate of MOSFET,TR1) through resistors R814 and R808. TR1 turns ON and Drain current starts to flow through the primary winding (NP) of T801. At the same time a voltage is induced at the ND1 winding which keeps a voltage on the Gate and TR1 stays ON. Drain current continues to flow and increases the voltage across the current detecting resistor R805 (IC801 pin 8). This induced voltage is integrated by the R/C time constant of IC801 internal resistor R3 and external capacitor C828 (pin 7). The voltage is applied to the Base of IC801 internal transistor TR3.

Regulation

The primary winding of T801 (NP) and the secondary windings (NS) are wired with opposite polarity. When TR1 is conducting. The current flows through winding NP. The secondary windings (NS) have no current because the B+ rectifier diodes block the flow.

The current flowing through TR1 and NP winding increases at a linear rate. When the voltage between Pins 1 and 3 of IC801 reach a fixed voltage of approximately 40.5V, TR1 turns OFF by the operation of IC801 internal error amp. This provides a state of regulation.

The secondary windings NS are wired so their voltages are in proportion to the voltage across the ND2 winding. Therefore output voltage is controlled by the error amp monitoring the voltage across ND2 winding and controls the conduction of TR1.

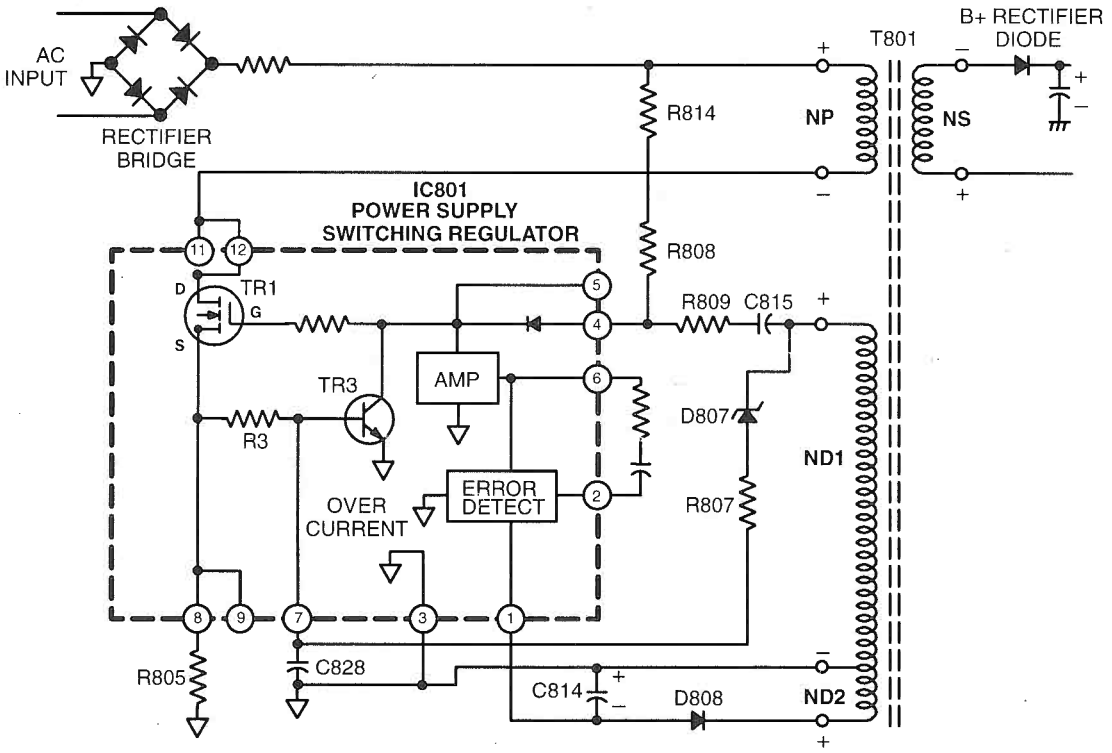
When TR1 turns OFF, the energy stored in T801 primary winding (NP) collapses and induces an opposite polarity voltage across the secondary windings (NS). B+ Rectifier diodes now conduct and allow current flow. When the total energy has collapsed at the primary winding, the ND2 winding also has a low voltage. The voltage across IC801 Pins 1 and 3 is now less than 40.5V and the internal error amp turns OFF to allow TR1 to conduct again. Reverse voltage polarity is again induced across the primary winding. This series of events repeats and the voltages of the secondary windings increase. When TR1 turns OFF, the energy is transferred to the secondary windings and TR1 is turned back on by the backswing. A stable oscillation begins.

Over Current/Voltage Protection

The over current/voltage protection circuit consist of IC801 internal components R3,TR3 and external components R805 (Pins 8, 9), R807, D807 (Pin7). Capacitor C828 (Pin 7) filters the base bias voltage of internal transistor TR3.

When output power increases because of a defect in a B+ source and excessive current flows, the Source current of TR1 increases. The voltage drop across R805 increases to cause oscillation frequency to decrease. Thus output voltage lowers. In other words, when the voltage drop across R805 increases, the base bias for TR3 also increases. When the bias reaches 0.6V,TR3 conducts and loads down the TR1 Gate bias to turn TR1 OFF. At the same time, the ND1 winding's current flows through R807 and D807 to produce a negative voltage and prevents TR1 from turning ON, as an overvoltage protection.

The Source current of TR1 is a triangular wave shape. When output current increase, the on time of TR1 stays constant but the off time becomes longer. As a result, frequency decreases and the output power decreases for over current/voltage protection.



Power Supply Protection

A new feature has been added to the NA3 chassis family. MPU (IC001). Pin 19 is a dual function Pin. The ACTION button function is activated when Pin 19 voltage is 0.588V or less. An Over Voltage Protect function is activated when Pin 19 voltage is 3.2V or higher.

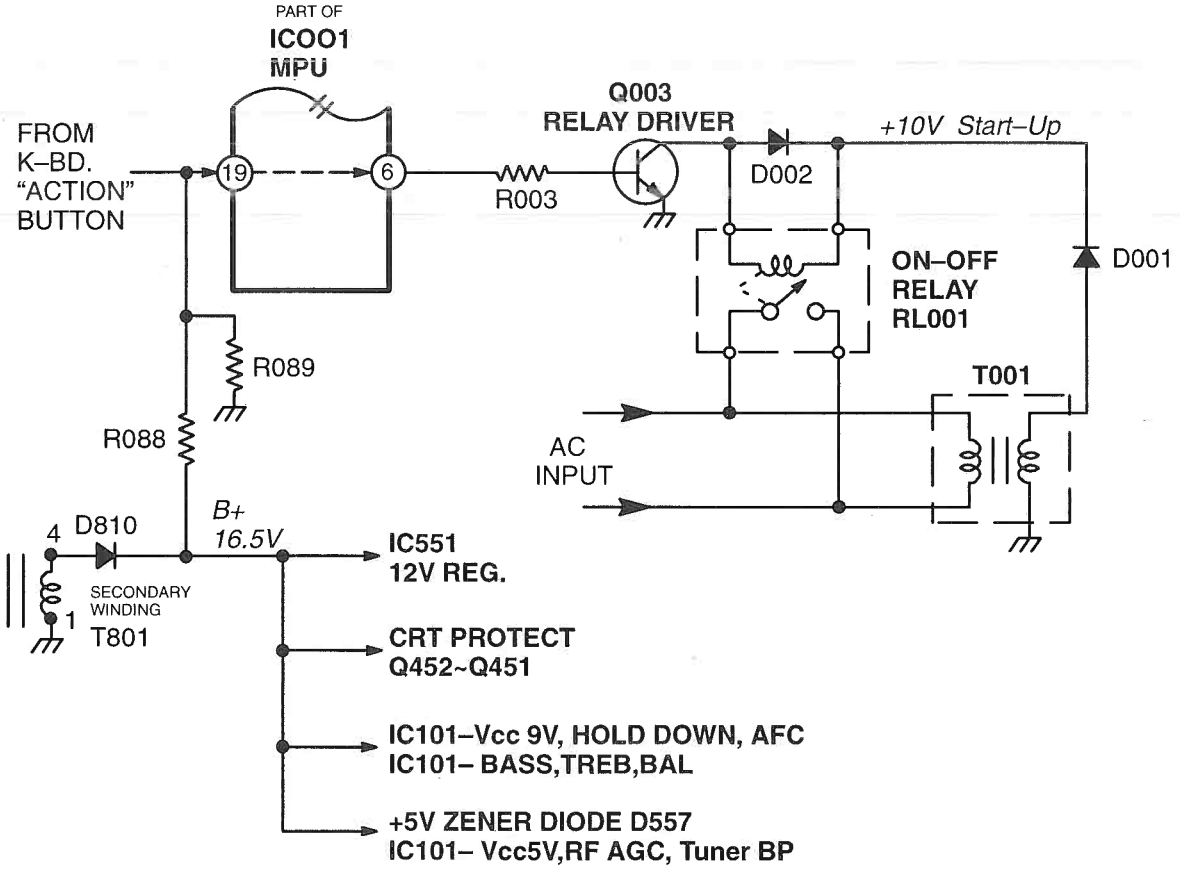
With the Receiver on, the power supply B+ 16.5V is monitored and voltage divided by R088/R089. As long as the voltage at IC001 Pin 19 is 0.6V~3.1V (depending on power supply operation) the Receiver operates normally.

If a major power supply switching I.C. failure occurs, the power supply may far exceed the normal +16.5V ±2V specification. IC001 Pin 19 voltage will increase above 3.2V and internal circuitry of the IC will cause Pin 6 (power) to go low. When this happens, the base of Q003 is held low and it can not conduct. Relay RL001 deenergizes to open the on contact in the relay and shuts the Receiver off.

This condition will remain until AC power is momentarily disconnected.

If when pressing the power button after AC is applied again and the Receiver comes on but goes off after a few seconds, there is a problem in the Receiver's power supply.

WARNING: Because Pin 19 is a dual function Pin, do not press the "ACTION" button on the Receiver. Pressing the button when the above symptom appears will inhibit the Overvoltage Protection and if the Receiver is powered on again, severe damage may happen to the entire chassis. If IC801 is changed to correct a power supply failure, also check or change D806, D807and D808 before reapplying power to the chassis. During a major failure, these components can fail, causing the I.C. to appear to operate normally, but it may run very hot, leading to another I.C. failure very quickly.



Horizontal Hold Down Circuit

This circuit protects against excessive high voltage and CRT beam current. If for any reason high voltage and/or CRT beam current exceeds a predetermined level, the Hold Down Circuit operates to increase horizontal frequency. If the level increases more, the Hold Down Circuit will blank the CRT.

CRT heater voltage from pin 6 of flyback transformer (FBT) T551 is rectified by diode D531. This voltage is directly proportional to high voltage variations. The voltage is filtered and divided down by precision resistors R532/R533 to approximately 2.4V and applied to Pin 49 (Hold Down) of IC101. With this voltage as a normal condition, the Hold Down Circuit is inactive and has no effect on horizontal frequency or blanking the CRT.

The Hold Down Circuit inside IC101 is a (NPN) differential amp. One base of the differential amp is connected to Pin 49 (approximately 2.4V). The other is connected to Pin 51 through an internal voltage divided of equal resistance. Pin 51 is clamped at a 6V DC reference voltage by zener diode D532. The voltage at the base of the differential amp is 3V. (1/2 of the reference voltage, 6V)

Basically, the Hold Down Circuit compares the voltage at Pin 49 (approximately 2.4V) to half of Pin 51 (clamped 6V). If CRT heater pulse amplitude from T551 (representative of high voltage) increases, the positive voltage at the cathode of D531 and at Pin 49 of IC101 also increase.

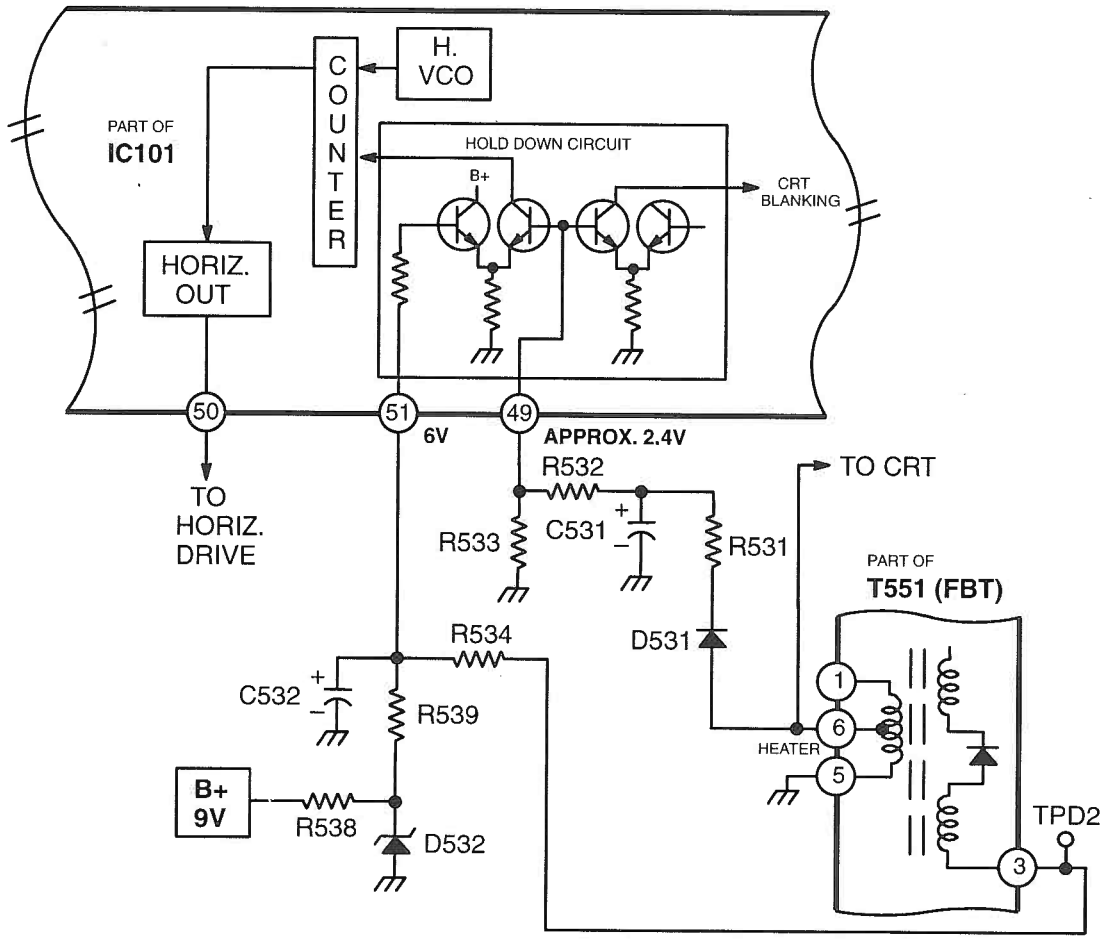
When the increased DC voltage at Pin 49 exceeds half of the Pin 51 reference voltage by a predetermined amount, the Hold Down Circuit (differential amp) changes conduction state and shifts the horizontal count down for a higher sweep frequency (out of sync condition) to prevent unsafe operation. For further safety when the Pin 49 voltage is extremely excessive, another internal differential amp changes state to blank the CRT.

An increase in CRT beam current produces more negative ABL voltage at Pin 3 of T551 (FBT) which is coupled to Pin 51 of IC101 via resistor R534. This increased negative voltage opposes the positive voltage at Pin 51 and lowers the DC reference voltage to less than 6V. This in turn causes the Hold Down Circuit to operate sooner when Pin 49 voltage increases.

Thus excessive levels of high voltage and/or increased CRT beam current cause determining of the horizontal oscillator frequency and eventual blanking of the CRT to assure operation within safe limits.

The B+ circuit and the Hold Down Circuit are not adjustable. If components in the designated areas of the schematic for critical parts are changed, operation of the Hold Down Circuit must be checked to insure that high voltage and CRT beam current does not exceed safe operation parameters. Check the following for possible failure:

1. Measure the DC voltage at Pin 49 of IC101 (reading should be close to +2.4V). If not, check D531, R531, C531, R532, R533 and IC101.
2. Measure the DC voltage at Pin 51 of IC101. (reading should be +6V) if not, check R534, C532, R539, D532, R538 and IC101.



CRT Protection Circuit

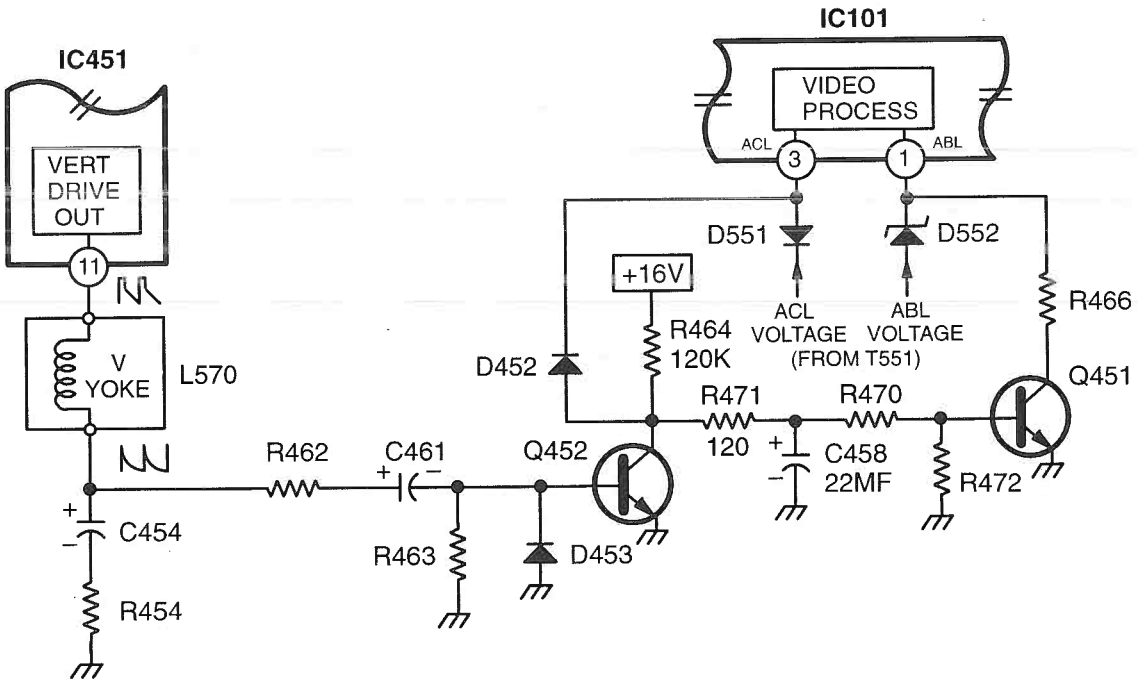
The CRT Protection Circuit is made up of transistors Q452 and Q451. The circuit blanks the CRT in the event of vertical sweep loss.

During normal operation, Q452 monitors vertical sweep by being connected to the low side of the vertical yoke L570. When Q452 is off, C458 starts to charge up from the 16V source through resistors R464 and R471. The RC time constant is such that the charging is slow. When Q452 is conducting, C458 discharges through R471 and the transistor to ground. The RC time constant is such that the discharge is fast. The slow charging and fast discharging along with voltage divider R470/R472 prevents sufficient bias for transistor Q451 to conduct. With Q451 not conducting, Pin 1 of IC101 is high and ABL functions normally.

If yoke current ceases (due to an open yoke or no voltage at IC451 Pin 11), there is no base bias for transistor Q452. The transistor is now always non conductive. Capacitor C458 is now allowed to charge a longer time to supply enough bias through voltage divider R470/R472 for Q451 to conduct. When it does, the voltage at Pin 1 of IC101 goes low and cuts off CRT beam current.

Diode D452 is added to the collector of Q452 to prevent the circuit from operation when Pin 3 of IC101 is grounded for Service Switch function when setting CRT cutoff.

It is important for CRT life that this circuit be checked before returning a repaired receiver to a customer. A quick test is to short Q452 base to ground. The CRT should blank. If not, troubleshoot the circuit for cause.



Service Notes

Leadless Chip Components

Chip transistors must be replaced with identical chip components due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chip capacitor or resistor board solder pads may have holes thru the board but hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor replacement may also be limited for the same reason. It is recommended that identical chip components be used for replacement purposes.

Chip resistors have a three digit numerical resistance code – 1st and 2nd significant digits and a multiplier. Example: 162=1600 or 1.6K ohm resistor, 0=0 ohms (jumper).

Chip capacitors generally do not have the value indicated. The body color indicates a general range of capacity.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor. See coding chart.

Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

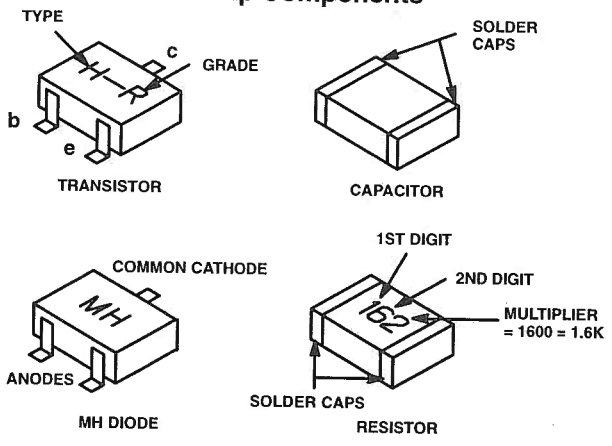
Component Removal

1. Use solder wick to remove solder from component end caps or terminals.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

Chip Component Installation

1. Put small amount of solder on board soldering pads.
2. Hold chip component against soldering pads with tweezers or a miniature alligator clip and apply heat to pad area with 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.
3. Remove iron and continue to hold component against pads until solder solidifies.

Chip Components

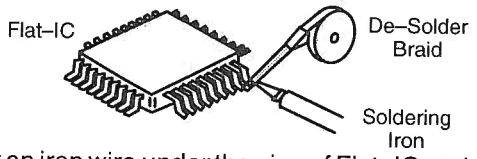


How to Replace Flat–IC

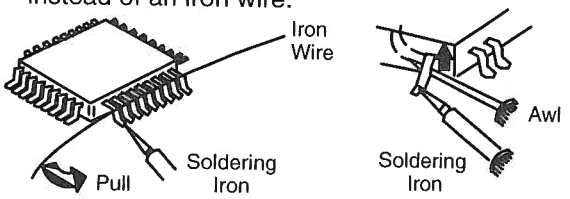
– Tools Required –

- Soldering iron
- De–solder braids
- Iron wire or small awl
- Magnifier

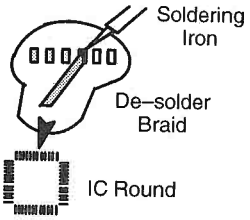
1. Remove the solder from all pins of Flat–IC by using de–solder braid.



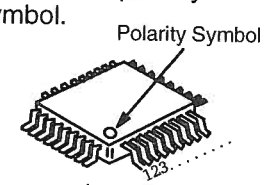
2. Put an iron wire under the pins of Flat–IC and pull it in the directions indicated while heating the pins using a soldering iron. A small awl can be used, instead of an iron wire.



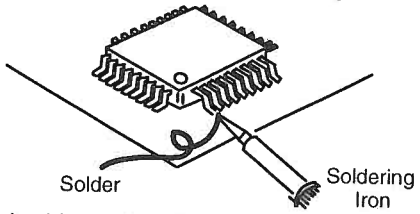
3. Remove the solder from all pads of Flat–IC by using de–solder braid.



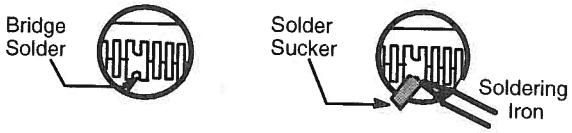
4. Put the new Flat–IC in place (apply the pins of Flat–IC to the soldering pads where the pins must be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol.



5. Solder all pins properly to connect to the soldering pads using a sharpened soldering iron.



6. Check with a magnifier for unneeded solder bridge between the pins or dry joint between pins and soldering pads. To remove solder bridge, use de–solder braids as shown in figure.



NOTE: ***These components are affixed with glue, be careful not to break or damage any foil under the component or at each pin of IC's when removing it. Usually applying heat to the component for a short time while twisting with tweezers will break the affixed glue.***

REPLACEMENT PARTS LIST

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

Ref. No.	Part No.	Description
		CAPRISTORS
CRA801	**EXNG131P365**	**RES-CAP 130PF/3.6 MEG**
		CAPACITORS
C001	ECKF1H103ZF	CAP,C .01UF-Z-50V
C002	ECEA1CU220	CAP,E 22UF/16V
C004	ECKF1H101KB	CAP,C 100PF-K-50V
C005	ECKF1H101KB	CAP,C 100PF-K-50V
C006	ECKF1H101KB	CAP,C 100PF-K-50V
C007	ECKF1H101KB	CAP,C 100PF-K-50V
C008	ECEA0JU331	CAP,E 330UF/6.3V
C009	ECEA1CU100	CAP,E 10UF/16V
C010	ECEA1CU100	CAP,E 10UF/16V
C011	ECEA1CU100	CAP,E 10UF/16V
C012	ECEA1HU2R2	CAP,E 2.2UF/50V
C013	ECKF1H103ZF	CAP,C .01UF-Z-50V
C014	ECEA0JU102	CAP,E 1000UF/6.3V
C017	ECEA0JU101	CAP,E 100UF/6.3V
C019	ECKF1H103ZF	CAP,C .01UF-Z-50V
C022	ECCF1H330JP	CAP,C 33PF-J-50V
C023	ECCF1H150JP	CAP,C 15PF-J-50V
C024	ECKF1H102KB	CAP,C .001UF-K-50V
C025	ECKF1H101KB	CAP,C 100PF-K-50V
C026	ECEA1CU102	CAP,E 1000UF/16V
C031	ECRHA020D41	TRIMMER: 20PF
C035	ECKF1H103ZF	CAP,C .01UF-Z-50V
C036	ECEA0JU101	CAP,E 100UF/6.3V
C037	ECEA0JU101	CAP,E 100UF/6.3V
C045	ECEA1CU471	CAP,E 470UF/16V
C046	ECKF1H103ZF	CAP,C .01UF-Z-50V
C047	ECEA1CU221	CAP,E 220UF/16V
C060	ECKF1H103ZF	CAP,C .01UF-Z-50V
C061	ECKF1H103ZF	CAP,C .01UF-Z-50V
C101	ECKF1H103ZF	CAP,C .01UF-Z-50V
C102	ECEA1CU100	CAP,E 10UF/16V
C103	ECKF1H103ZF	CAP,C .01UF-Z-50V
C104	ECEA1HUR22	CAP,E .22UF/50V
C105	ECCF1H270JC	CAP,C 27PF-J-50V
C106	ECKF1H122KB	CAP,C .0012UF-K-50V
C107	ECEA1HUR47	CAP,E .47UF/50V
C109	ECEA0JU101	CAP,E 100UF/6.3V
C110	ECKF1H103ZF	CAP,C .01UF-Z-50V
C113	ECEA1CU100	CAP,E 10UF/16V
C151	ECEA1HUR22	CAP,E .22UF/50V
C152	ECCF1H820JC	CAP,C 82PF-J-50V
C153	ECKF1H103ZF	CAP,C .01UF-Z-50V
C201	ECCF1H680JC	CAP,C 68PF-J-50V
C202	ECKF1H103ZF	CAP,C .01UF-Z-50V
C203	ECKF1H103ZF	CAP,C .01UF-Z-50V
C207	ECEA1CN100S	CAP,E 10UF/16V
C301	ECEA1CN100S	CAP,E 10UF/16V
C302	ECEA1AU331	CAP,E 330UF/10V
C303	ECEA1CU220	CAP,E 22UF/16V
C304	ECEA1HU010	CAP,E 1UF/50V
C305	ECEA1HUR33	CAP,E .33UF/50V
C306	ECEA1EU4R7	CAP,E 4.7UF/25V
C309	ECEA1HN010S	CAP,E 1UF/50V
C310	ECEA1CU100	CAP,E 10UF/16V
C311	ECQB1H473KF	CAP,P .047UF-K-50V
C312	ECEA1CU220	CAP,E 22UF/16V
C313	ECCF1H820K	CAP,C 82PF-K-50V
C315	ECKF1H181KB	CAP,C 180PF-K-50V
C351	ECKF1H821KB	CAP,C 820PF-K-50V
C352	ECKF1H681KB	CAP,C 680PF-K-50V
C353	ECKF1H102KB	CAP,C .001UF-K-50V
C354	ECEA1CU100	CAP,E 10UF/16V
C355	ECKD3D102KB	CAP,C .001UF-K-2KV
C356	ECEA1CU100	CAP,E 10UF/16V
C357	ECKF1H102KB	CAP,C .001UF-K-50V
C359	ECKF1H331KB	CAP,C 330PF-K-50V
C401	ECEA1HUR33	CAP,E .33UF/50V
C402	ECKF1H331KB	CAP,C 330PF-K-50K
C403	ECEA1HN010S	CAP,E 1UF/50V
C451	**ECEA1CGE221**	**CAP,E 220UF/16V**
C452	ECSF1EE105	CAP,T 1.0UF/25V
C453	ECEA50Z1B	CAP,E 1UF/50V
C454	ECEA1EGE102	CAP,E 1000UF/25V
C455	ECEA1VU101	CAP,E 100UF/35V
C456	ECQB1H473KF	CAP,P .047UF-K-50V
C457	ECEA1HGE0R1	CAP,E .1UF/50V
C458	ECEA1CU220	CAP,E 22UF/16V
C459	ECCF1H101K	CAP,C 100PF-K-50V
C461	ECEA1HU010	CAP,E 1UF/50V
C502	ECEA1HU010	CAP,E 1UF/50V
C503	ECQB1H333KF	CAP,P .033UF-K-50V
C504	ECKF1H103ZF	CAP,C .01UF-Z-50V
C505	ECQB1H223KF	CAP,P .022UF-K-50V
C506	ECEA1AU221	CAP,E 220UF/10V
C507	ECKF1H221KB	CAP,C 220PF-K-50V
C508	ECQB1H223KF	CAP,P .022UF-K-50V
C509	ECCF1H221JU	CAP,C 220PF-J-50V
C510	ECCD2H100D	CAP,C 10PF-D-500V
C511	ECKD2H821KB	CAP,C 820PF-K-500V
C515	**ECKD2H101KB**	**CAP,C 100PF-K-500V**
C531	**ECEA1EU330**	**CAP,E 33UF/25V**
C532	**ECEA1CU220**	**CAP,E 22UF/16V**
C541	ECCF1H680JP	CAP,C 68PF-J-50V
C542	ECKF1H101KB	CAP,C 100PF-K-50V
C543	ECKF1H221KB	CAP,C 220PF-K-50V
C555	**ECEA2EU220**	**CAP,E 22UF/250V**
C556	**ECKD2H561KB**	**CAP,C 560PF-K-500V**
C557	**ECEA1CU221**	**CAP,E 220UF/16V**
C560	ECEA2AU220	CAP,E 22UF/100V
C561	**ECEA1HU2R2**	**CAP,E 2.2UF/50V**
C562	**ECQF2H504JS**	**CAP,P .5UF-J-200V**
C563	**ECWH12H103JS**	**CAP,P .01UF-J-1.2KV**
C564	**ECWH12H392JS**	**CAP,P .0039UF-J-1.2KV**
C565	**ECKD3D122JB**	**CAP,C .0012UF-J-2KV**
C566	**ECKD3D181JB**	**CAP,C 180PF-J-2KV**
C567	**ECQM2562JZ**	**CAP,P .0056UF-J-200V**
C568	**ECQM2473JZ**	**CAP,P .047UF-J-200V**
C569	**ECEA160V33Z**	**CAP,E 33UF/160V**
C578	ECKD2H331KB	CAP,C 330PF-K-500V
C580	**ECKD3D561JB**	**CAP,C 560PF-J-2KV**
C601	ECCF1H101J	CAP,C 100PF-J-50V
C602	ECCF1H150JU	CAP,C 15PF-J-50V
C754	ECQB1H104KF	CAP,P .1UF-K-50V
C755	ECQB1H104KF	CAP,P .1UF-K-50V
C756	ECEA0JU221	CAP,E 220UF/6.3V
C757	ECA1VM102E	CAP,E 1000UF/35V
C759	ECQE1395KN	CAP,P .068UF-K-100V
C801	**ECKD2H472PU**	**CAP,C .0047UF-P-500V**
C802	**ECKD2H472PU**	**CAP,C .0047UF-P-500V**
C803	**ECKD2H472PU**	**CAP,C .0047UF-P-500V**
C804	**ECKD2H472PU**	**CAP,C .0047UF-P-500V**
C805	**ECES2DU471M**	**CAP,E 470UF/200V**
C806	**ECQU2A153MN**	**CAP,P .015UF-M-250VAC**
C807	**ECQU2A153MN**	**CAP,P .015UF-M-250VAC**
C808	**ECKFNS222ME**	**CAP,C .0022UF-M-125VAC**
C809	**ECQU2A224MN**	**CAP,P .22UF-M-250VAC**
C810	**ECQM2473KZ**	**CAP,P .047UF-K-200V**
C811	**ECKD3A471KB**	**CAP,C 470PF-K-1KV**
C812	**ECKD3A102KB**	**CAP,C .001UF-K-1KV**
C813	**ECKD2H471KB**	**CAP,C 470PF-K-500V**
C814	**ECEA1JU100**	**CAP,E 10UF/63V**
C815	**ECQB1H273KF**	**CAP,P .027UF-K-50V**
C816	**ECKD3A152KB**	**CAP,C .0015UF-K-1KV**
C817	**ECKD3A561KB**	**CAP,C 560PF-K-1KV**
C818	**ECES2DU221E4**	**CAP,E 220UF/200V**
C819	**ECKD2H391KB**	**CAP,C 390PF-K-500V**
C820	**ECEA1VU102**	**CAP,E 1000UF/35V**
C821	**ECKD2H471KB**	**CAP,C 470PF-K-500V**
C822	**ECEA1EU102**	**CAP,E 1000UF/25V**
C823	**ECKD2H561KB**	**CAP,C 560PF-K-500V**
C824	**ECEA1EU222**	**CAP,E 2200UF/25V**

REPLACEMENT PARTS LIST

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

Ref. No.	Part No.	Description
C828	**ECQB1H473KF**	**CAP,P .047UF–K–50V**
C829	**ECKD2H331KB**	**CAP,C 330PF–K–500V**
C831	**ECEA1VU101**	**CAP,E 100UF/35V**
C959	ECEA1AU331	CAP,E 330UF/10V
C962	ECCF1H101J	CAP,C 100PF–J–50V
C2201	ECEA1EU4R7	CAP,E 4.7UF/25V
C2202	ECEA1EU4R7	CAP,E 4.7UF/25V
C2203	ECEA1EU4R7	CAP,E 4.7UF/25V
C2204	ECQB1H104JF	CAP,P .1UF–J–50V
C2205	ECEA50ZR68	CAP,E .68UF/50V
C2206	ECEA1CU101	CAP,E 100UF/16V
C2207	ECEA1EU4R7	CAP,E 4.7UF/25V
C2208	ECEA1EU4R7	CAP,E 4.7UF/25V
C2209	AP106K016CAE	CAP,T 10UF/16V
C2210	ECQB1H104KF	CAP,P .1UF–K–50V
C2211	AP335K016CAE	CAP,T 3.3UF/16V
C2212	ECEA1HUR47	CAP,E .47UF/50V
C2213	ECEA50ZR33	CAP,E .33UF/50V
C2214	ECEA1EU4R7	CAP,E 4.7UF/25V
C2215	ECQB1H104KF	CAP,P .1UF–K–50V
C2216	ECUX1H102JCX	CAP,C .001UF–J–50V
C2217	ECQB1H683JF	CAP,P .068UF–J–50V
C2218	ECUX1H222KBX	CAP,C .0022UF–K–50V
C2219	ECUX1H103KBX	CAP,C .01UF–K–50V
C2220	ECEA1EU4R7	CAP,E 4.7UF/25V
C2301	ECEA1CU470	CAP,E 47UF/16V
C2302	ECEA1CU470	CAP,E 47UF/16V
C2303	ECEA1HU3R3	CAP,E 3.3UF/50V
C2304	ECQB1H682KF	CAP,P .0068UF–K–50V
C2305	ECQB1H682KF	CAP,P .0068UF–K–50V
C2306	ECEA1HU3R3	CAP,E 3.3UF/50V
C2307	ECEA1CU470	CAP,E 47UF/16V
C2308	ECEA1EU102	CAP,E 1000UF/25V
C2309	ECQB1H104KF	CAP,P .1UF–K–50V
C2310	ECQB1H104KF	CAP,P .1UF–K–50V
C2311	ECEA1AU331	CAP,E 330UF/10V
C2312	ECEA1AU331	CAP,E 330UF/10V
C2313	ECEA1CU101	CAP,E 100UF/16V
C2320	ECEA1CU470	CAP,E 47UF/16V
C2321	ECEA1HU010	CAP,E 1UF/50V
C2322	ECEA1CU470	CAP,E 47UF/16V
C2323	ECUX1H103KBX	CAP,C .01UF–K–50V
C2324	ECQB1H683KF	CAP,P .068UF–K–50V
C2325	ECEA1HN3R3S	CAP,E 3.3UF/50V
C2326	ECEA1HN3R3S	CAP,E 3.3UF/50V
C2327	ECUX1H103KBX	CAP,C .01UF–K–50V
C2328	ECQB1H683KF	CAP,P .068UF–K–50V
C2340	ECEA1CU100	CAP,E 10UF/16V
C2341	ECEA1CU100	CAP,E 10UF/16V
C2342	ECEA1HU010	CAP,E 1UF/50V
C2343	ECEA1HU010	CAP,E 1UF/50V
C2344	ECEA1CU221	CAP,E 220UF/16V
C3001	ECEA1HU010	CAP,E 1UF/50V
C3002	ECEA1HU010	CAP,E 1UF/50V
C3003	ECEA1CU100	CAP,E 10UF/16V
C3004	ECEA1AU220	CAP,E 22UF/10V
C3005	ECEA1AU220	CAP,E 22UF/10V
C3006	ECEA1CU470	CAP,E 47UF/16V
C3007	ECUX1H103KBX	CAP,C .01UF–K–50V
C3031	ECEA1CU100	CAP,E 10UF/16V
C3032	ECEA1CU100	CAP,E 10UF/16V
C3034	ECEA1HU010	CAP,E 1UF/50V
C3035	ECEA1HU010	CAP,E 1UF/50V
C3036	ECEA1HN3R3S	CAP,E 3.3UF/50V
C3037	ECEA1HN3R3S	CAP,E 3.3UF/50V
C3201	ECEA1AU470	CAP,E 47UF/10V
C3202	ECQB1H473KF	CAP,P .047UF–K–50V
C3203	ECUX1H103KBX	CAP,C .01UF–K–50V
C3204	ECUX1H103KBX	CAP,C .01UF–K–50V
C3206	ECEA1AN220S	CAP,E 22UF/10V
C3207	ECUX1H103ZFX	CAP,C .01UF–Z–50V
C3208	ECUX1H101JX	CAP,C 100PF–J–50V
C3209	ECUX1H121JCX	CAP,C 120PF–J–50V
C3212	ECUX1H390JX	CAP,C 39PF–J–50V

Ref. No.	Part No.	Description
		DIODES
D001	ERA15–01	DIODE
D002	MA167	DIODE
D003	TVSQA205D	DIODE
D004	MA4062M	DIODE, ZENER
D006	1N4532	DIODE
D022	1N4532	DIODE
D025	1N4532	DIODE
D026	MA165	DIODE
D303	MA165	DIODE
D351	MA165	DIODE
D352	MA4062L	DIODE, ZENER
D353	MA4062L	DIODE, ZENER
D355	MA4062L	DIODE, ZENER
D451	ERA15–01	DIODE
D452	1N4532	DIODE
D453	MA165	DIODE
D454	MA4120M	DIODE
D455	MA4120M	DIODE
D501	TVSQA208C	DIODE, ZENER
D531	**AS01**	**DIODE**
D532	**TVSQA206M**	**DIODE, ZENER**
D542	MA4051M	DIODE, ZENER
D551	MA165	DIODE
D552	MA4051M	DIODE, ZENER
D553	1N4532	DIODE
D554	**AS01**	**DIODE**
D555	MA165	DIODE
D556	**MA4360H**	**DIODE, ZENER**
D557	TVSQB105N	DIODE, ZENER
D558	RS3FS	DIODE
D559	TVSRU2MV	DIODE
D560	TVSQB109SA	DIODE
D563	TVSQB109SA	DIODE
D801	**TVSRM11B**	**DIODE**
D802	**TVSRM11B**	**DIODE**
D803	**TVSRM11B**	**DIODE**
D804	**TVSRM11B**	**DIODE**
D805	**TRPW5B0M050D**	**THERMISTOR**
D806	**TVSRU1CV**	**DIODE**
D807	**TVSQA207D**	**DIODE, ZENER**
D808	**ERA15–02**	**DIODE**
D809	**TVSRU3AN**	**DIODE**
D810	**RU3YX–MV1**	**DIODE**
D811	**RU3YX–MLF–C2**	**DIODE**
D812	**AU02**	**DIODE**
D2301	MA1360M	DIODE, ZENER
D2302	MA4360M	DIODE
D2303	MA4360M	DIODE
D2305	MA165	DIODE
D2306	MA165	DIODE
D3001	MA165	DIODE
D3002	MA165	DIODE
D3005	MA4110H	DIODE, ZENER
		FUSES
F001	**0BA1C40NU100**	**FUSE 4.0A/125V**
		INTEGRATED CIRCUITS
IC001	MN1873234QAS	INT CKT
IC002	24C02AIP	INT CKT
IC003	MN1280R	INT CKT
IC101	**AN5163K**	**INT CKT**
IC451	**LA7836–TV**	**INT CKT**
IC551	**AN78M12**	**PLUS 12V AVR**
IC801	**STK730–020**	**INT CKT**
IC2201	AN5817FB	INT CKT
IC2301	**TA8200AH**	**INT CKT**
IC2302	CXA1279S	INT CKT
IC2340	XRA15218N	INT CKT

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
IC3001	M52055P	INT CKT
IC3031	M52055P	INT CKT
		COILS
L001	EXCELSA24	FERRITE BEAD
L005	TLUABTA100K	COIL, PEAKING 10UH
L009	TLUABTA120K	COIL, PEAKING 12UH
L011	TLUABTA1R0K	COIL, PEAKING 1.0UH
L101	TLUABTA150K	COIL, PEAKING 15UH
L103	EIV7EN041B	COIL, AFT
L105	EIV7EN053B	VCO
L106	TLQ012K205C	COIL, PEAKING 1.2UH
L107	TLQ012K205C	COIL, PEAKING 1.2UH
L108	TLUABTA1R0K	COIL, PEAKING 1.0UH
L109	TLUABTA1R0K	COIL, PEAKING 1.0UH
L201	EIS7ES004B	COIL, QUADRATURE
L351	TLUABTA151K	COIL, PEAKING 150UH
L551	**TLH6618P**	**COIL, LINEARITY**
L552	EXCELSA24	FERRITE BEAD
L553	EXCELSA24	FERRITE BEAD
L554	0SC9002	FERRITE BEAD
L555	0SC9002	FERRITE BEAD
L556	0SC9002	FERRITE BEAD
L557	0SC9002	FERRITE BEAD
L558	EXCELSA24	FERRITE BEAD
L570	**TLY15460F**	**YOKE, DEFLECTION**
L601	TLUABTA100K	COIL, PEAKING 10UH
L751	**TLH15727**	**REACTOR, PINCUSHION**
L801	**ELF18D666A**	**LINE FILTER**
L803	**EXCELSA39**	**FERRITE BEAD**
L804	**EXCELSA39**	**FERRITE BEAD**
L805	**0SC9002**	**FERRITE BEAD**
L806	**EXCELSA35**	**FERRITE BEAD**
L807	**0SC9002**	**FERRITE BEAD**
L808	**0SC9002**	**FERRITE BEAD**
L809	**0SC9002**	**FERRITE BEAD**
L810	**EXCELSA24**	**FERRITE BEAD**
L811	**EXCELSA35**	**FERRITE BEAD**
L813	**0SC9002**	**FERRITE BEAD**
L814	**0SC9002**	**FERRITE BEAD**
L815	**0SC9002**	**FERRITE BEAD**
L816	**0SC9002**	**FERRITE BEAD**
L820	**0LK19020**	**COIL, DEGAUSSING**
L2301	EXCELSA24	FERRITE BEAD
L3201	EFDEN645B35B	DELAY LINE
L3202	EIK1EG024B	DELAY LINE
L3203	TLUABTA180K	COIL, PEAKING 18UH
L3204	TLUABTA8R2K	COIL, PEAKING 8.2UH
		TRANSISTORS
Q002	JC501PQ	TRANSISTOR
Q003	JC501PQ	TRANSISTOR
Q007	JC501PQ	TRANSISTOR
Q008	JC501PQ	TRANSISTOR
Q015	JA101PQ	TRANSISTOR
Q101	JC501PQ	TRANSISTOR
Q305	JC501PQ	TRANSISTOR
Q306	JC501PQ	TRANSISTOR
Q307	JC501PQ	TRANSISTOR
Q351	2SC3063	TRANSISTOR
Q352	2SC3063	TRANSISTOR
Q353	2SC3063	TRANSISTOR
Q354	JA101PQ	TRANSISTOR
Q451	JC501PQ	TRANSISTOR
Q452	JC501PQ	TRANSISTOR
Q501	2SC4212H	TRANSISTOR
Q541	JC501PQ	TRANSISTOR
Q551	**BU2508DF**	**TRANSISTOR**
Q751	2SD637QRS	TRANSISTOR
Q752	2SB642QRS	TRANSISTOR
Q753	2SD1266	TRANSISTOR
Q2201	MSD601R	TRANSISTOR
Q2202	MSD601R	TRANSISTOR
Q3201	MSD601R	TRANSISTOR
Q3202	MSD601R	TRANSISTOR
Q3203	MSD601R	TRANSISTOR
Q3204	MSD601R	TRANSISTOR
Q3205	MSD601R	TRANSISTOR
Q3206	MSD601R	TRANSISTOR
		RELAYS
RL001	**TSE1864**	**RELAY**
		RESISTORS
R002	ERDS2TJ103	RES,C 10K–J–1/4
R003	ERDS2TJ102	RES,C 1K–J–1/4
R004	ERDS1TJ331	RES,C 330–J–1/2
R005	ERD25TJ101	RES,C 100–J–1/4
R007	ERDS2TJ102	RES,C 1K–J–1/4
R008	ERDS2TJ182	RES,C 1.8K–J–1/4
R013	ERDS2TJ473	RES,C 47K–J–1/4
R018	ERDS2TJ472	RES,C 4.7K–J–1/4
R019	ERDS2TJ472	RES,C 4.7K–J–1/4
R020	ERDS2TJ474	RES,C 470K–J–1/4
R021	ERDS2TJ101	RES,C 100–J–1/4
R022	ERDS2TJ101	RES,C 100–J–1/4
R023	ERD25TJ101	RES,C 100–J–1/4
R024	ERD25TJ101	RES,C 100–J–1/4
R025	ERD25TJ101	RES,C 100–J–1/4
R026	ERDS2TJ102	RES,C 1K–J–1/4
R030	ERDS2TJ683	RES,C 68K–J–1/4
R031	ERDS2TJ823	RES,C 82K–J–1/4
R037	ERD25TJ473	RES,C 47K–J–1/4
R038	ERDS2TJ333	RES,C 33K–J–1/4
R039	ERDS2TJ333	RES,C 33K–J–1/4
R040	ERDS2TJ822	RES,C 8.2K–J–1/4
R042	ERDS2TJ203	RES,C 20K–J–1/4
R043	ERDS2TJ473	RES,C 47K–J–1/4
R044	ERDS2TJ473	RES,C 47K–J–1/4
R045	ERDS2TJ123	RES,C 12K–J–1/4
R050	ER0S2CKF1002	RES,M 10K–F–1/4
R055	ERDS1FJ330	RES,C 33–J–1/2
R056	ERDS2TJ102	RES,C 1K–J–1/4
R058	ERDS2TJ242	RES,C 2.4K–J–1/4
R059	ERDS2TJ222	RES,C 2.2K–J–1/4
R060	ERDS2TJ332	RES,C 3.3K–J–1/4
R061	ERDS2TJ512	RES,C 5.1K–J–1/4
R062	ERDS2TJ912	RES,C 9.1K–J–1/4
R063	ERDS2TJ223	RES,C 22K–J–1/4
R065	ERDS2TJ101	RES,C 100–J–1/4
R067	ERDS2TJ562	RES,C 5.6K–J–1/4
R071	ERDS2TJ101	RES,C 100–J–1/4
R072	ERD25TJ101	RES,C 100–J–1/4
R073	ERDS2TJ273	RES,C 27K–J–1/4
R074	ERG2ANJ683	RES,M 68K–J–2W
R076	ERDS2TJ273	RES,C 27K–J–1/4
R085	ERDS2TJ124	RES,C 120K–J–1/4
R086	ERDS2TJ474	RES,C 470K–J–1/4
R088	ERDS2TJ223	RES,C 22K–J–1/4
R089	ERDS2TJ392	RES,C 3.9K–J–1/4
R091	ERD25TJ272	RES,C 2.7K–J–1/4
R092	ERDS2TJ332	RES,C 3.3K–J–1/4
R093	ERDS2TJ152	RES,C 1.5K–J–1/4
R094	ERDS2TJ393	RES,C 39K–J–1/4
R102	ERDS2TJ393	RES,C 39K–J–1/4
R103	ERDS2TJ153	RES,C 15K–J–1/4
R104	ERDS2TJ121	RES,C 120–J–1/4
R105	ERD25TJ102	RES,C 1K–J–1/4
R106	EVND2AA03B14	CONTROL 10K
R107	ERDS2TJ222	RES,C 2.2K–J–1/4
R111	ERDS2TJ361	RES,C 360–J–1/4
R112	ERDS2TJ561	RES,C 560–J–1/4
R113	ERDS2TJ473	RES,C 47K–J–1/4

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
R114	ERDS2TJ104	RES,C 100K–J–1/4
R152	ERDS2TJ154	RES,C 150K–J–1/4
R201	ERD25TJ221	RES,C 220–J–1/4
R202	ERD25TJ682	RES,C 6.8K–J–1/4
R203	ERDS2TJ392	RES,C 3.9K–J–1/4
R204	ERD25TJ472	RES,C 4.7K–J–1/4
R304	ERDS2TJ274	RES,C 270K–J–1/4
R305	ERDS2TJ102	RES,C 1K–J–1/4
R306	ERDS2TJ102	RES,C 1K–J–1/4
R307	ERDS2TJ682	RES,C 6.8K–J–1/4
R317	ERDS2TJ122	RES,C 1.2K–J–1/4
R318	ERDS2TJ681	RES,C 680–J–1/4
R319	ERDS2TJ182	RES,C 1.8K–J–1/4
R324	ERD25TJ331	RES,C 330–J–1/4
R326	ERDS2TJ221	RES,C 220–J–1/4
R327	ERDS2TJ222	RES,C 2.2K–J–1/4
R328	ERDS2TJ332	RES,C 3.3K–J–1/4
R332	ERDS2TJ272	RES,C 2.7K–J–1/4
R339	ERD25TJ514	RES,C 510K–J–1/4
R351	ERG2ANJ123	RES,M 12K–J–2W
R352	ERG2ANJ123	RES,M 12K–J–2W
R353	ERG2ANJ123	RES,M 12K–J–2W
R354	ERDS1TJ272	RES,C 2.7K–J–1/2
R355	ERDS1TJ272	RES,C 2.7K–J–1/2
R356	ERDS1TJ272	RES,C 2.7K–J–1/2
R357	ERDS2TJ221	RES,C 220–J–1/4
R358	ERDS2TJ221	RES,C 220–J–1/4
R359	ERDS2TJ221	RES,C 220–J–1/4
R360	ERDS2TJ511	RES,C 510–J–1/4
R361	ERDS2TJ123	RES,C 12K–J–1/4
R362	ERDS2TJ561	RES,C 560–J–1/4
R364	ERDS2TJ101	RES,C 100–J–1/4
R365	ERDS2TJ101	RES,C 100–J–1/4
R366	ERD25TJ101	RES,C 100–J–1/4
R371	ERDS2TJ221	RES,C 220–J–1/4
R372	ERDS2TJ221	RES,C 220–J–1/4
R373	ERDS2TJ221	RES,C 220–J–1/4
R401	ERDS2TJ224	RES,C 220K–J–1/4
R402	ERDS2TJ561	RES,C 560–J–1/4
R404	ERDS2TJ221	RES,C 220–J–1/4
R451	ERDS2TJ681	RES,C 680–J–1/4
R452	ERDS2TJ273	RES,C 27K–J–1/4
R453	EVND2AA03B34	CONTROL 30K
R454	ERDS1FJ1R8	RES,C 1.8–J–1/2
R455	ERDS2TJ223	RES,C 22K–J–1/4
R456	ERDS2TJ153	RES,C 15K–J–1/4
R457	ERDS2TJ222	RES,C 2.2K–J–1/4
R458	ERDS2TJ273	RES,C 27K–J–1/4
R459	ERDS2TJ102	RES,C 1K–J–1/4
R461	ERDS2TJ102	RES,C 1K–J–1/4
R462	ERDS2TJ473	RES,C 47K–J–1/4
R463	ERDS2TJ224	RES,C 220K–J–1/4
R464	ERDS2TJ124	RES,C 120K–J–1/4
R466	ERD25TJ101	RES,C 100–J–1/4
R467	ERD25TJ102	RES,C 1K–J–1/4
R470	ERDS2TJ153	RES,C 15K–J–1/4
R471	ERDS2TJ271	RES,C 270–J–1/4
R472	ERDS2TJ103	RES,C 10K–J–1/4
R501	ERDS2TJ102	RES,C 1K–J–1/4
R502	ERDS2TJ222	RES,C 2.2K–J–1/4
R503	ERDS2TJ182	RES,C 1.8K–J–1/4
R504	ERDS2TJ561	RES,C 560–J–1/4
R505	ERDS2TJ561	RES,C 560–J–1/4
R506	ERDS2TJ390	RES,C 39–J–1/4
R507	ERDS2TJ562	RES,C 5.6K–J–1/4
R508	ERDS2TJ562	RES,C 5.6K–J–1/4
R509	ERG2ANJ562	RES,M 5.6K–J–2W
R510	**ERG2ANJ242**	**RES,M 2.4K–J–2W**
R511	**ERG2ANJ242**	**RES,M 2.4K–J–2W**
R516	ERD25TJ681	RES,C 680–J–1/4
R517	ERDS2TJ224	RES,C 220K–J–1/4
R531	**ERD25FJ470**	**RES,C 47–J–1/4**
R532	**ER0S2CKF5362**	**RES,M 53.6K–F–1/4**
R533	**ER0S2CKF7151**	**RES,M 7.15K–F–1/4**
R534	**ERD25TJ684**	**RES,C 680K–J–1/4**
R538	**ERDS2TJ821**	**RES,C 820–J–1/4**
R539	**ERDS2TJ681**	**RES,C 680–J–1/4**
R541	ERDS2TJ272	RES,C 2.7K–J–1/4
R542	ERDS2TJ121	RES,C 120–J–1/4
R544	ERDS2TJ562	RES,C 5.6K–J–1/4
R547	ERDS2TJ102	RES,C 1K–J–1/4
R554	ERDS2TJ104	RES,C 100K–J–1/4
R555	ERDS2TJ393	RES,C 39K–J–1/4
R556	ERDS2TJ182	RES,C 1.8K–J–1/4
R557	ERDS2TJ103	RES,C 10K–J–1/4
R558	**ERQ1CJP1R6**	**RES,F 1.6–J–1W**
R559	**ERG3ANJ820**	**RES,M 82–J–3W**
R560	**ERG2ANJ680**	**RES,M 68–J–2W**
R561	**ERG2ANJ270**	**RES,M 27–J–2W**
R563	ERG1ANJ102	RES,M 1K–J–1W
R565	ERDS1FJ131	RES,C 130–J–1/2
R580	ERG5ZJ681	RES,M 680–J–5W
R601	ERDS2TJ152	RES,C 1.5K–J–1/4
R602	ERD25TJ392	RES,C 3.9K–J–1/4
R604	ERDS2TJ331	RES,C 330–J–1/4
R605	ERDS2TJ331	RES,C 330–J–1/4
R606	ERDS2TJ331	RES,C 330–J–1/4
R607	ERD25TJ202	RES,C 2K–J–1/4
R608	ERD25TJ202	RES,C 2K–J–1/4
R609	ERD25TJ202	RES,C 2K–J–1/4
R610	ERDS2TJ182	RES,C 1.8K–J–1/4
R611	ERDS2TJ681	RES,C 680–J–1/4
R612	ERDS2TJ681	RES,C 680–J–1/4
R613	ERDS2TJ681	RES,C 680–J–1/4
R614	ERD25TJ222	RES,C 2.2K–J–1/4
R615	ERDS2TJ103	RES,C 10K–J–1/4
R616	ERDS2TJ103	RES,C 10K–J–1/4
R617	ERDS2TJ103	RES,C 10K–J–1/4
R618	ERDS2TJ392	RES,C 3.9K–J–1/4
R619	ERDS2TJ331	RES,C 330–J–1/4
R752	ERDS2TJ153	RES,C 15K–J–1/4
R753	ERDS2TJ153	RES,C 15K–J–1/4
R754	ERDS2TJ221	RES,C 220–J–1/4
R755	ERDS2TJ563	RES,C 56K–J–1/4
R756	ERDS2TJ103	RES,C 10K–J–1/4
R757	ERDS2TJ224	RES,C 220K–J–1/4
R758	ERDS2TJ273	RES,C 27K–J–1/4
R759	ERDS2TJ222	RES,C 2.2K–J–1/4
R760	EVND8AA03B53	CONTROL 5K
R761	EVND8AA03B14	CONTROL 10K
R762	ERDS2TJ182	RES,C 1.8K–J–1/4
R763	ERDS2TJ183	RES,C 18K–J–1/4
R764	ERDS2TJ124	RES,C 120K–J–1/4
R765	ERDS2TJ272	RES,C 2.7K–J–1/4
R766	ERDS2TJ362	RES,C 3.6K–J–1/4
R767	ERDS2TJ222	RES,C 2.2K–J–1/4
R768	ERQ2CJP100	RES,F 10–J–2W
R801	**ERF5ZKR82**	**RES,W .82–K–5W**
R802	**ERC12ZGM825**	**RES,S 8.2MEG–M–1/2**
R803	**ERW12PK1R0**	**RES,W 1.0–K–1/2**
R804	**ERG2ANJ333**	**RES,M 33K–J–2W**
R805	**ERQ2CJPR39**	**RES,F .39–J–2W**
R806	**ERDS2TJ273**	**RES,C 27K–J–1/4**
R807	**ERDS2TJ132**	**RES,C 1.3K–J–1/4**
R808	**ERDS2TJ185**	**RES,C 1.8MEG–J–1/4**
R809	**ERDS2TJ101**	**RES,C 100–J–1/4**
R810	**ERDS1FJ1R0**	**RES,C 1.0–J–1/2**
R811	**ERQ1CKPR33**	**RES,F .33–K–1W**
R812	**ERQ1CKPR33**	**RES,F .33–K–1W**
R813	**ERQ1CKPR33**	**RES,F .33–K–1W**
R814	**ERDS2TJ185**	**RES,C 1.8MEG–J–1/4**
R816	**ERDS2TJ105**	**RES,C 1MEG–J–1/4**
R2201	ERJ6GEYJ512	RES,M 5.1K–J–1/10
R2202	ERJ6GEYJ112	RES,M 1.1K–J–1/10
R2203	ERJ6ENF5602	RES,M 56K–F–1/10
R2204	ERJ6GEYJ562	RES,M 5.6K–J–1/10
R2205	ERJ6GEYJ153	RES,M 15K–J–1/10
R2206	ERJ6GEYJ823	RES,M 82K–J–1/10

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
R2207	ERJ6GEYJ153	RES,M 15K–J–1/10
R2208	ERJ6GEYJ154	RES,M 150K–J–1/10
R2209	EVND8AA03B54	CONTROL 50K
R2210	ERJ6GEYJ134	RES,M 130K–J–1/10
R2211	ERJ6GEYJ154	RES,M 150K–J–1/10
R2212	ERJ6GEYJ222	RES,M 2.2K–J–1/10
R2213	EVND8AA03B54	CONTROL 50K
R2215	ERJ6GEYJ333	RES,M 33K–J–1/10
R2216	ERJ6GEYJ333	RES,M 33K–J–1/10
R2218	ERJ6GEYJ333	RES,M 33K–J–1/10
R2219	ERJ6GEYJ223	RES,M 22K–J–1/10
R2220	EVND8AA03B34	CONTROL 30K
R2221	EVND8AA03B34	CONTROL 30K
R2222	ERJ6GEYJ153	RES,M 15K–J–1/10
R2223	ERJ6GEYJ363	RES,M 36K–J–1/10
R2226	ERJ6GEYJ474	RES,M 470K–J–1/10
R2228	ERDS2TJ683	RES,C 68K–J–1/4
R2245	ERDS2TJ683	RES,C 68K–J–1/4
R2301	ERDS2TJ222	RES,C 2.2K–J–1/4
R2302	ERDS2TJ222	RES,C 2.2K–J–1/4
R2303	ERDS2TJ222	RES,C 2.2K–J–1/4
R2304	ERDS2TJ222	RES,C 2.2K–J–1/4
R2305	ERD25FJ2R2	RES,C 2.2–J–1/4
R2306	ERD25FJ2R2	RES,C 2.2–J–1/4
R2310	ERD25FJ680	RES,C 68–J–1/4
R2311	ERJ6GEYJ184	RES,M 180K–J–1/10
R2312	ERJ6GEYJ184	RES,M 180K–J–1/10
R2313	ERJ6GEYJ563	RES,M 56K–J–1/10
R2315	ERJ6GEYJ103	RES,M 10K–J–1/10
R2316	ERJ6GEYJ103	RES,M 10K–J–1/10
R2317	ERD25TJ102	RES,C 1K–J–1/4
R2340	ERJ6GEYJ332	RES,M 3.3K–J–1/10
R2342	ERJ6GEYJ473	RES,M 47K–J–1/10
R2345	ERJ6GEYJ472	RES,M 4.7K–J–1/10
R2346	ERJ6GEYJ332	RES,M 3.3K–J–1/10
R2348	ERJ6GEYJ473	RES,M 47K–J–1/10
R2349	ERJ6GEYJ472	RES,M 4.7K–J–1/10
R2350	ERJ6GEYJ332	RES,M 3.3K–J–1/10
R2351	ERDS2TJ222	RES,C 2.2K–J–1/4
R2352	ERDS2TJ332	RES,C 3.3K–J–1/4
R2353	ERDS2TJ222	RES,C 2.2K–J–1/4
R2354	ERJ6GEYJ681	RES,M 680–J–1/10
R3001	ERDS2TJ103	RES,C 10K–J–1/4
R3002	ERDS2TJ103	RES,C 10K–J–1/4
R3003	ERJ6GEYJ184	RES,M 180K–J–1/10
R3004	ERJ6GEYJ184	RES,M 180K–J–1/10
R3005	ERJ6GEYJ101	RES,M 100–J–1/10
R3006	ERJ6GEYJ750	RES,M 75–J–1/10
R3007	ERJ6GEYJ471	RES,M 470–J–1/10
R3008	ERJ6GEYJ750	RES,M 75–J–1/10
R3009	ERDS2TJ122	RES,C 1.2K–J–1/4
R3010	ERJ6GEYJ750	RES,M 75–J–1/10
R3011	ERDS2TJ471	RES,C 470–J–1/4
R3012	ERDS2TJ683	RES,C 68K–J–1/4
R3013	ERDS2TJ103	RES,C 10K–J–1/4
R3014	ERJ6GEYJ683	RES,M 68K–J–1/10
R3015	ERJ6GEYJ104	RES,M 100K–J–1/10
R3031	ERDS2TJ471	RES,C 470–J–1/4
R3032	ERJ6GEYJ750	RES,M 75–J–1/10
R3033	ERJ6GEYJ184	RES,M 180K–J–1/10
R3034	ERDS2TJ103	RES,C 10K–J–1/4
R3035	ERJ6GEYJ184	RES,M 180K–J–1/10
R3036	ERDS2TJ103	RES,C 10K–J–1/4
R3037	ERJ6GEYJ683	RES,M 68K–J–1/10
R3038	ERDS2TJ683	RES,C 68K–J–1/4
R3201	ERJ6GEYJ123	RES,M 12K–J–1/10
R3202	ERJ6GEYJ393	RES,M 39K–J–1/10
R3203	ERJ6GEYJ101	RES,M 100–J–1/10
R3204	ERJ6GEYJ102	RES,M 1K–J–1/10
R3205	ERJ6GEYJ272	RES,M 2.7K–J–1/10
R3206	ERJ6GEYJ682	RES,M 6.8K–J–1/10

Ref. No.	Part No.	Description
R3207	ERJ6GEYJ103	RES,M 10K–J–1/10
R3208	ERJ6GEYJ102	RES,M 1K–J–1/10
R3209	ERJ6GEYJ102	RES,M 1K–J–1/10
R3210	ERJ6GEYJ103	RES,M 10K–J–1/10
R3211	ERJ6GEYJ181	RES,M 180–J–1/10
R3212	ERJ6GEYJ331	RES,M 330–J–1/10
R3213	ERJ6GEYJ102	RES,M 1K–J–1/10
R3214	ERJ6GEYJ331	RES,M 330–J–1/10
R3215	EVND8AA03B22	CONTROL 200 OHM
R3217	ERJ6GEYJ271	RES,M 270–J–1/10
R3218	ERJ6GEYJ122	RES,M 1.2K–J–1/10
R3220	ERJ6GEYJ221	RES,M 220–J–1/10
R3221	ERJ6GEYJ102	RES,M 1K–J–1/10
R3227	ERJ6GEYJ472	RES,M 4.7K–J–1/10
R3228	ERJ6GEYJ104	RES,M 100K–J–1/10
R3229	ERJ6GEYJ152	RES,M 1.5K–J–1/10
		SWITCHES
S001	EVQQBH12T	SWITCH, PUSH
S002	EVQQBH12T	SWITCH, PUSH
S003	EVQQBH12T	SWITCH, PUSH
S004	EVQQBH12T	SWITCH, PUSH
S005	EVQQBH12T	SWITCH, PUSH
S006	EVQQBH12T	SWITCH, PUSH
S007	EVQQBH12T	SWITCH, PUSH
		TRANSFORMERS
T001	**TLP16297**	**TRANSFORMER, POWER SUPPLY**
T501	**TLH15452**	**TRANSFORMER, HORIZONTAL DRIVER**
T551	**0LF04508F**	**TRANSFORMER, FLYBACK**
T801	**ETS39AF175AC**	**TRANSFORMER, POWER**
		CRYSTALS/FILTERS
X001	TSS2080MX	CRYSTAL, CLOCK
X101	EFCH45MVK12N	SAW FILTER
X102	EFCS4R5MW3BA	4.5MHZ TRAP
X201	EFCS4R5MS4W	FILTER 4.5MHZ BANDPASS
X501	EF0A503KS41	CRYSTAL, OSCILLATOR
X601	TS816M32	CRYSTAL 3.58MHZ OSCILLATOR
		OTHERS
M001	EAS12D537KG	SPEAKER, 3" X 5" 8 OHM
TNR001	**ENV568J5G3**	**U/V TUNER**
M002	EUR501200	TRANSMITTER, REMOTE CONTROL
M003	**M68JUA069X**	**CRT 27"**
M004	TBM2A10142	BADGE, PANASONIC
M005	TBX2885000G	ASSY. 7 PUSHBUTTON
JK3031	TJB18619	A/V INPUT 1 & 2: VAO & S–VIDEO JACK
M006	TES2A20311	SPRING, DAG GROUND
M007	**TJS1A5050**	**SOCKET, CRT**
M008	TKP1758094	GRILLE, SPEAKER
M009	TKP1812334	OVERLAY: CHNL/PWR/VOL
M010	TLC2047–2	MAGNET,RINGS: PURITY & STATIC CONV.
M011	TMM2A30202	WEDGE, DEFLECTION YOKE
M012	TQB2A0882	MANUAL, OWNERS'
M013	TXFKU1694SER	ASSY. CABINET BACK
M014	TXFKY2594SER	ASSY. CABINET FRONT
M015	TXF3A01XHR3R	ASSY. DAG GROUND
M016	T8A262	SILICONE GREASE–HEAT SINK COMPOUND
M017	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP
M018	0NQ1409	RECEIVER, REMOTE CONTROL
M019	**0SX1121**	**AC LINE CORD**

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description

ABBREVIATION OF PART NAME AND DESCRIPTION

RESISTOR

PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
C	Carbon	F	+/– 1%
F	Fuse	J	+/– 5%
M	Metal Oxide	K	+/– 10%
S	Solid	M	+/– 20%
W	Wire Wound	G	+/– 2%

Part No.	Description	
Example: ERD25TJ104 (C)	100KΩ (J)	1/4W

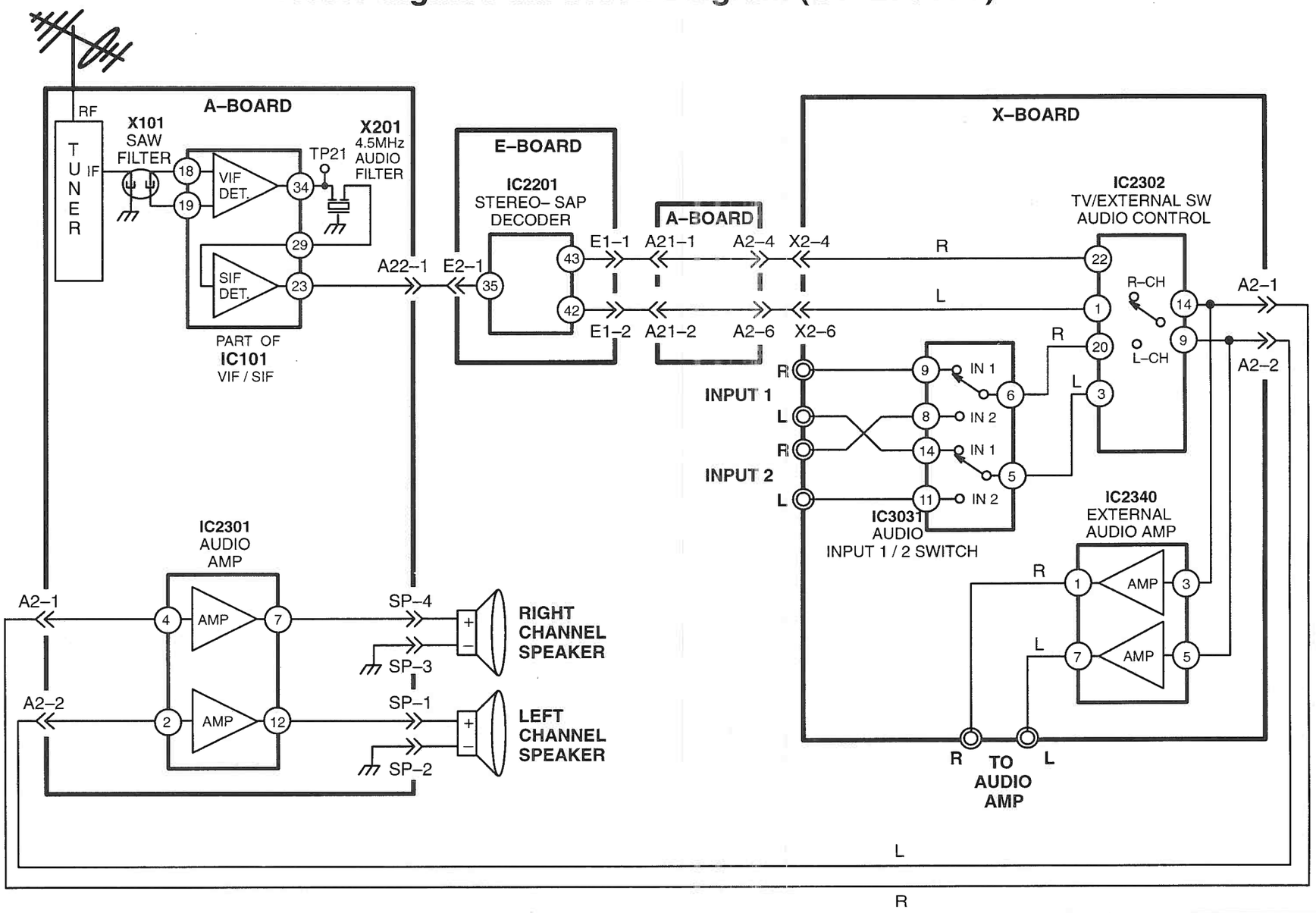
CAPACITOR

PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
C	Ceramic	C	+/– 0.25pF
E	Electrolytic	D	+/– 0.5pF
P	Polyester	F	+/– 1pF
S	Styrol	J	+/– 5%
T	Tantalum	K	+/– 10%
		L	+/– 15%
		M	+/– 20%
		P	+100% –0%
		Z	+80% –20%

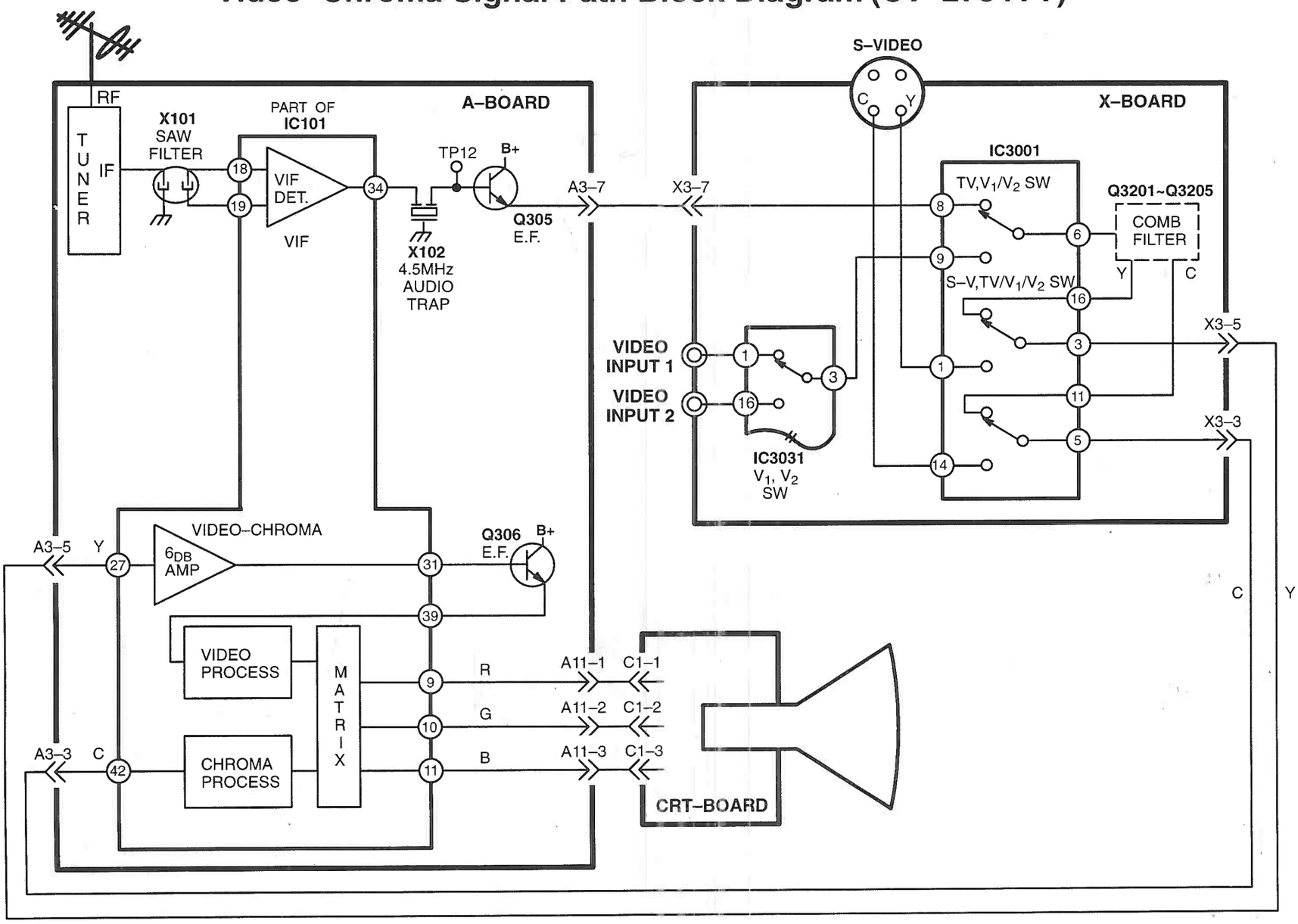
Part No.	Description	
Example: ECKF1H103ZF (C)	0.01µF (Z)	50V

Ref. No.	Part No.	Description

Audio Signal Path Block Diagram (CT-2784VY)



Video-Chroma Signal Path Block Diagram (CT-2784VY)



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